JUNE, 1944

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DO YOU HAVE A *Career Problem* TO SOLVE?

TO YOUNG MEN 17
. . . TO JUNE GRADUATES
TO ALL MEN INTERESTED IN AVIATION

Under the stress and strain of war time conditions, this career problem is naturally food for thought and cause for thorough consideration. But after all, the solution should not be difficult if YOU ask yourself these questions:

Shall I take a job, and hope to get ahead? Shall I pursue my normal course, letting fate and the call to military service take its course? Shall I look ahead, prepare myself and take specialized technical training for a future career?

Bearing in mind the great advances in aircraft development which are taking place today, obviously the answer to only one question offers the solution to the career problem—that is,—GET THE BEST TECHNICAL TRAINING AVAILABLE AND GET IT NOW.

For a preview of tomorrow's Age of Flight look at today's opportunity and rapid development in the Aircraft Industry. Then give a thought to the background of the men who are leaders and hold positions of responsibility. These men, you will find, have a foundation of thorough technical training from which they have advanced. Today, thousands of Curtiss-Wright Technical Institute graduates are engaged in all phases of aviation activity, both military and civil. All are making notable contributions to the national war effort.

CURTISS-WRIGHT TECHNICAL INSTITUTE offers you SPECIALIZED COURSES IN AERONAUTICAL ENGINEERING and MASTER AVIATION MECHANICS, specifically designed thoroughly to equip you for a broad and profitable career. They also serve the double purpose of preparing you for maximum service to our war effort and in case of military service, you will be in line for higher technical grades and ratings.

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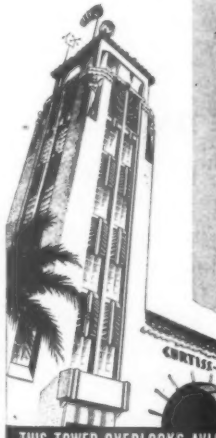
What this school has done for its thousands of graduates it can do for you,—send the coupon TODAY for our illustrated catalogue. It's free. The opportunity to solve your career problem is here. DO NOT DELAY. DO IT NOW.



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Trail Blazing in the Skies

HOW GOODYEAR AIRCRAFT CORPORATION SERVES THE AIRCRAFT INDUSTRY

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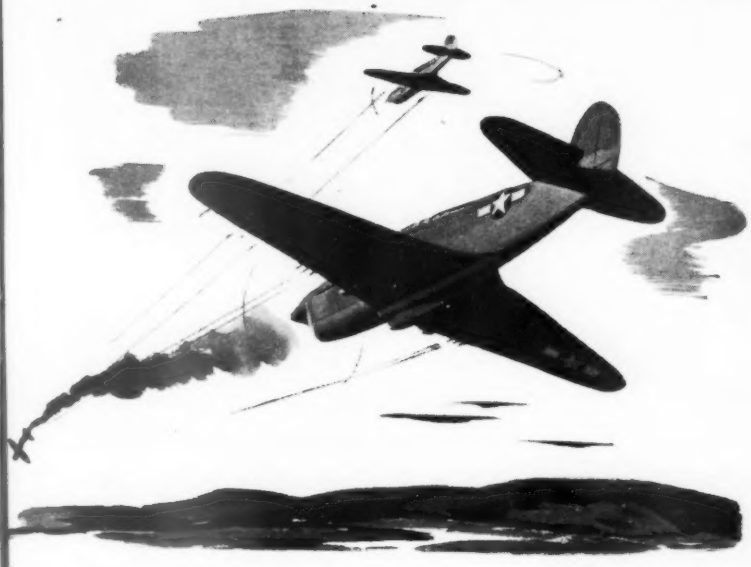
3. *By re-engineering parts for mass production.*
4. *By building complete airplanes and airships.*
5. *By extending the facilities of Goodyear Research to aid the solution of any design or engineering problem.*

NEW PRECISION IN MEASURING CABLE TENSIONS — Illustrative of Goodyear Aircraft Corporation's thoroughness in every phase of airplane construction is the development of the precision cable-tension indicator. This highly accurate instrument, built by Goodyear, measures the exact tension on airship and airplane control cables, giving an instant reading correct to the pound. With this device the cable does not have to be disconnected, making it possible to determine tensions precisely after installation. Many of these instruments are now being used by the air services.



THE RELIABLE P-40 WARHAWK is one of America's famous warplanes built in part by Goodyear Aircraft. Several thousand P-40's have flown into action with stabilizers that came from Goodyear assembly lines. Goodyear is proud that its long experience in aviation has contributed materially to the sturdiness of this rugged fighter — only one of many equipped with Goodyear-built wings, empennages, flaps, ailerons and numerous other components. Goodyear also builds complete airplanes and airships for the Navy.

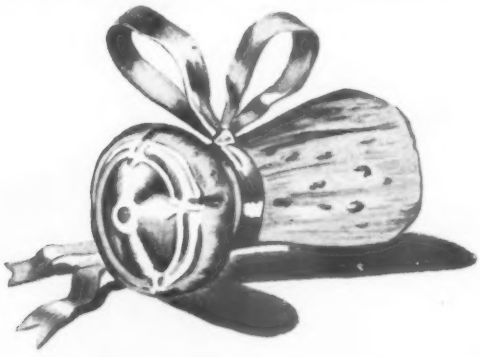
Let's all back the attack with **WAR BONDS**

GOODYEAR

GOODYEAR AIRCRAFT

They wouldn't fly without them...

A battered toy monkey goes along on every flight of one aerial gunner who, when we last heard from him, had personally cancelled five Zeros.



A champagne cork—memento of some very special evening—always hangs on the instrument panel of a sentimental co-pilot. It's helped to "pop" several Jerrys.

A black Homburg hat, instead of a regulation helmet, always adorns the head of one of the hottest RAF fighter pilots in the business.

ETHYL BRAND OF ANTI-KNOCK COMPOUND — ETHYL CORPORATION — TRADE MARK REG. U.S. PAT. OFF.

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Ethyl antiknock fluid goes along with every fighting plane powered by U. S. made gasoline. *It goes into every gallon of fighting grade aviation fuel*—and today more Ethyl is being used in each gallon than ever before.

ETHYL CORPORATION

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NOW! IMPARTIAL TEST PHOTOS PROVE WHICH TAIL WHEEL TIRE *HOLDS* BEST

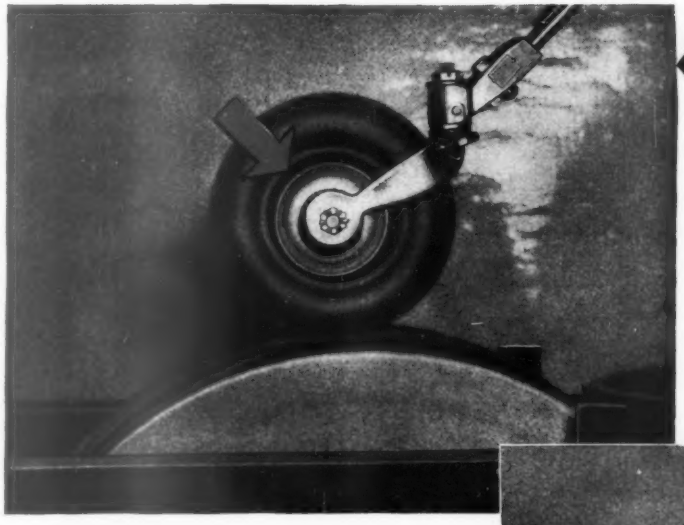
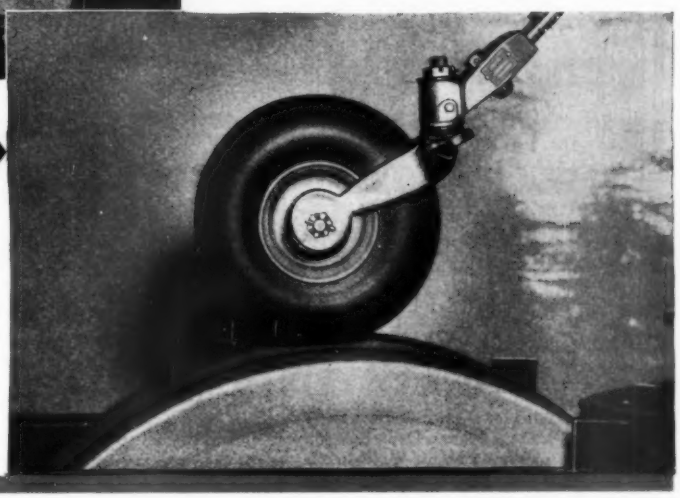


Photo shows competitive 6 x 2.00 tail wheel tire on test machine in laboratories of Scott Aviation Corporation—being rotated at equivalent of 30 miles per hour. Note how centrifugal force has separated beads of tire from the wheel. (arrow). Scott Aviation say, "...all (competitive tires) tested behave in exactly the same manner as the competitive tire pictured."

General 6x2.00 Tail Wheel Tire—on same wheel as above—at same speed. *Note complete lack of any distortion.* Note how it hugs the wheel perfectly . . . without any separation. Scott Aviation say, "General's steel wire bead makes it impossible for the tire to be thrown from the wheel."



GENERAL'S Exclusive STEEL WIRE BEAD Is The Answer!

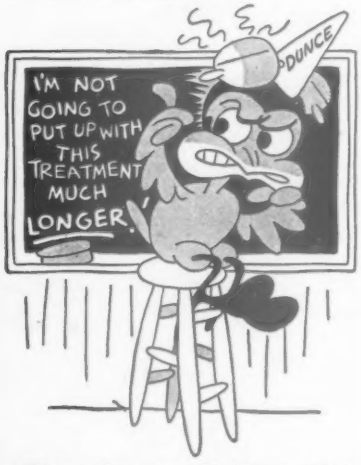
The General 6x2.00 tire—with exclusive steel wire bead—is typical of why all General Tail Wheel Tires have *consistently* proved their superiority in countless laboratory tests and in actual service by leading users. The complete General Tire-Tube-Wheel *combination* brings you General's famous *Top-Quality*—safe, dependable performance—exclusive features—*in one package* ready for quick installation. *Immediate delivery is available.* For further information write or wire:

AVIATION DIVISION • THE GENERAL TIRE & RUBBER COMPANY • AKRON, OHIO

The Birdmen's Perch

DID YOU KNOW that three of the pilots who do production tests on the Hellcat are girls?

Or that you could drive a car from Chicago to Los Angeles on the same amount of gasoline required to keep one of these slick Navy fighters up for an hour? That Liberators were originally designed to carry *two* guns, because their speed and ceiling were such that it was agreed that further armament was unnecessary?



We're going to try a Little-known Facts About Well-known Planes Dept. on you Perch Pilots for a few months. We'll do our best and we'll keep Flutter hopping to dig up items like the above.

But, as you know, Flutter hasn't much sense, ambition, or ability. So if you'll help out by sending in *your* Little-known Facts About Well-known Planes, it will be a more interesting undertaking than if left entirely to our two-cylinder tomtit.

If we use your "Fact," we will give you credit in the Perch. What's more, we'll send you a new and rare honor—a commission as a Perch Pilot (br)*.

Major Al Williams,

alias "Tattered Wing Tips," Gulf Aviation Products Manager, Gulf Bldg., Pittsburgh 30, Pa.

*Bottom Rung

★ ★ ★

INCREASING RANGE

Here's a postwar thought that you can have fun with:

Imagine your Cadet, Reliant, or Voyager with detachable fuel tanks—smaller and lighter versions of the disposable tanks used on our war planes. Of course, private flyers wouldn't "dispose" of their extra tanks. But they could remove the tank for local operations.

And on XC trips, they could clamp on the teardrop tank and carry an extra 400-or-so miles worth of that Good Gulf Aviation Gas. How does that sound?

Now here's a thought you can have fun with right now:

Imagine a lubricant with "detachable hydrocarbons." Imagine you were able to "detach" from this lubricant more of the hydrocarbons which don't actually lubricate—the carbon makers and sludge formers—by a technique which you might name the Alchlor Process. Imagine that what was left of this unusual lubricant did a better job of lubricating, and WHAMMY! . . . it's no longer an image . . .

. . . it's Gulfpride Oil!

BRAINTWISTER

In charge of maintenance of an L-shaped flight strip (see diagram), a popular officer made himself even more popular when he divided the work among his four groups of men. For he divided the area into four sections of *equal size and shape.*

If you can't figure how he did it, in less than 60 seconds, you'd better write us for the answer at the address on the left.

Gulf Oil Corporation and Gulf Refining Company . . . makers of

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INVESTIGATE ANY "GIVE" OR "SLACK" IN FLIGHT OR ENGINE OPERATING CONTROLS···
AT THE FIRST OPPORTUNITY SO THAT CAUSE MAY BE DETERMINED AND IMMEDIATELY···
ELIMINATED. ALSO ELIMINATE THE POSSIBILITY OF GETTING ANYTHING IN YOUR···
···FUEL TANKS BUT THAT GOOD GULF AVIATION GASOLINE!
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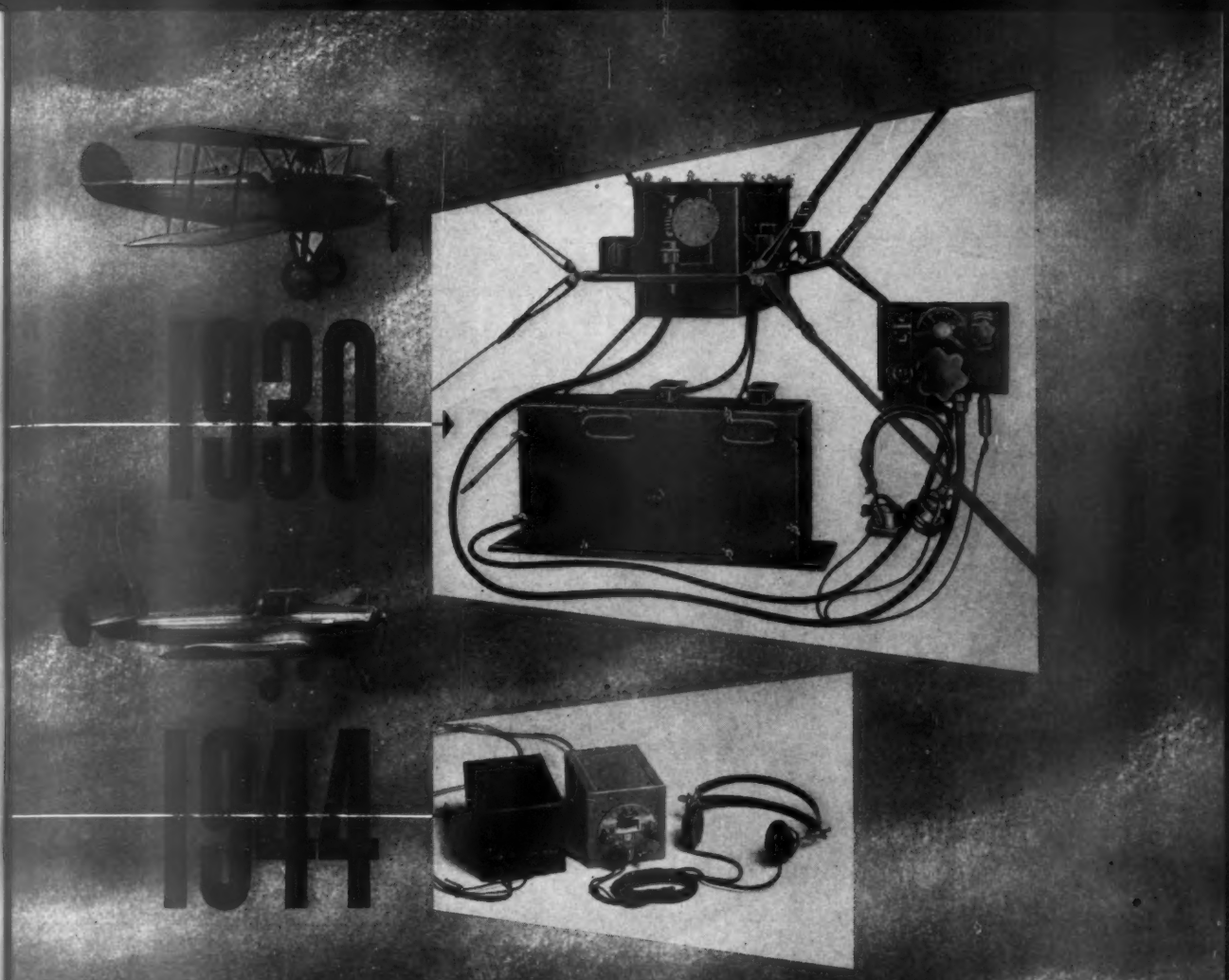

14 YEARS OF AVIATION RADIO

In 1930 airplanes were "crates." Wire, cloth, slats. Mostly biplane. Wonderful, but fearful. Compare these old machines with the streamlined, compact safety models of today.

Year by year aviation radio has kept pace. Matched progress. Produced RCA aircraft radio that is lighter, that does more, that is more dependable.

For example, shown at the upper left is an RCA aircraft receiver of 1930. The equivalent RCA 1944 equipment is less than one-eighth as bulky and one-fifth as heavy. Yet it does a far better job and provides two frequency ranges (550 to 1500 kc. and 195 to 450 kc.), instead of the one range available with the 1930 apparatus.

This is a typical example of RCA initiative and ability in developing improved radio equipment. In the years to come this progress will be maintained in further development of RCA aviation radio that meets the most exacting requirements of military, transport and light plane service.

RCA

RCA AVIATION RADIO

RADIO CORPORATION OF AMERICA

CAMDEN, N. J.

TODAY AND TOMORROW

Today, tomorrow and until the war is won every Allison engine is built to a standard that embraces five "must" qualities: ★ *Performance* that helps our fighters win battles. ★ *Reliability* on which our pilots can depend. ★ *Smoothness* to lessen pilot fatigue. ★ *Economy* for greatest fighting range. ★ *Durability* for maximum fighting readiness. ★ Vital now for our flyers, these are also characteristics you will want in engines that will power postwar planes.

POWERED BY ALLISON

The more-than-50,000 Allison engines built for the U. S. Army Air Forces power the following planes: P-38—Lightning • P-39—Airacobra P-40—Warhawk • A-36 and P-51—Mustang

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Rods furnished on special order to customer's specifications

7 sizes in both fork and eye types

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3/8-24

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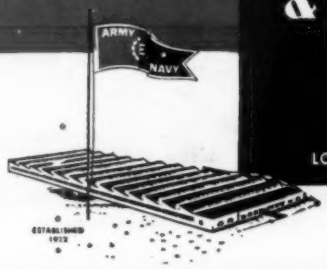

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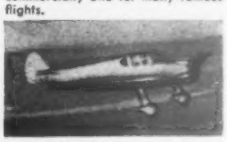
RYAN-STANDARD cabin plane; pioneer passenger airliner.

RYAN BROUGHAM, widely used commercially and for many famous flights.



RYAN S-C, cabin plane for private-owner use, featured all-metal construction.

RYAN YO-51 "Dragonfly", Army observation plane with unique performance ability.

RYAN NR-1, low-wing trainer used for formation flight instruction by Navy.

RYAN ST3-S, seaplane trainer of same series as Army's PT-22.

RYAN PT-25, superbly engineered plastic-bonded plywood trainer.

Wings Across the Sea

THAT FREEDOM MAY NOT DIE

Half surrounding Japan's ill-won new territories are Chinese, Indian and Australian air bases. In these countries are thousands of potentially fine pilots, as eager as their American brothers in arms to fight the common enemy.

HELPING ARM OUR ALLIES

But *grounded* valor is of little avail against Japanese air power. Only modern training and modern equipment can turn this eagerness into effective military use.

Ryan is proud of its contribution in Asia and Australia toward this end. Widely used for training military pilots for the U. S. Army Air Forces, Ryan planes were in China and the Netherlands East Indies in training operations before the war. Now Ryan planes are doing their full share in important military assignments for China and in Australia and India. Of course, details of these military assignments cannot now be published.

TO STRIKE HARDER BLOWS

In addition to other vital war work, Ryan activities now include the engineering development and manufacture of advanced type combatant airplanes and important assemblies for the armed services. Into these is going knowledge that will make Ryan peacetime planes and other products safer, more useful and more economical.

RYAN

Rely on Ryan to Build Well

RYAN BUILDS WELL

Ryan construction, proven in aviation's pioneer days, now proven in war, will tomorrow produce safer, more useful peacetime aircraft.

RYAN TRAINS WELL

Ryan School of Aeronautics, famous peacetime air school, now training fine U.S. Army pilots, follows one creed: **Thoroughness.**

RYAN PLANS WELL

Modern engineering + **flying experience.** Typical result: Ryan exhaust manifold systems are now used on the finest planes of other manufacturers.

RYAN AERONAUTICAL COMPANY, SAN DIEGO — MEMBER, AIRCRAFT WAR PRODUCTION COUNCIL, INC.

Ryan Products: Army PT-22s; Navy NR-1s; Army PT-25s; S-T Commercial and Military Trainers; Exhaust Manifold Systems and Bomber Assemblies.

CLEARING the South Pacific atolls of Tojo's yellow hordes calls for eternal vigilance. Jap moves must be spotted fast. Where are they? How many are there? What are they up to? The only way to get the answers is from the air.

On a June day last year a flight of eleven Corsair fighters took off on patrol from their South Pacific base. The job of combing vast areas of sea and pin-point islands for signs of the wily Jap can be monotonous. But it's a job that calls for constant alertness. For anything can happen. And it usually does—when least expected.

Major Ray L. Vroone, U. S. M. C., and First Lt. W. H. Snee, U. S. M. C., were in the flight above the clouds. Suddenly the clouds break. There, 1,000 feet below are 20 to 25 Zeros, out looking for trouble. The flight pounces for the kill. The Japs, caught on the spot, duck into the safety of a cloud bank. Our fighting Marines have plenty of scores to settle with the Nip. 50 miles they press the chase. But the Zeros had scored a disappearing act.

By now, the unsettled weather that provided the Japs with cover had closed all landing fields in the home area. Vroone and Snee became separated from the other planes in the flight. Snee's gas was running perilously low. He signalled Major Vroone he was forced to make a water landing. Setting his fighter plane down in the water off a small island, Snee got clear before it sank and reached shore safely in his rubber boat.

Vroone had radioed the base of his companion's plight. Swiftly to the rescue came an Edo-equipped Navy *Kingfisher*, one of the famed "mercy ships of the air," piloted by Lt. (j. g.) W. C. Adams, U. S. N. R. Skillfully, Adams taxied his ship shoreward and, within a scant two hours after his forced landing, Lt. Snee was hitchhiking back to his base.

But a major can't fly any farther on a gallon of gas than a first lieutenant. Major Vroone, too, was forced down when his gas gave out. Lt. (j. g.) Grant Herreid, U. S. N. R., flying another *Kingfisher* was ordered out to find him. In a little more than an hour, he located the Marine Major on an island beach. By then a heavy sea was rolling. Herreid negotiated his water landing but had to avoid the pounding surf. Vroone, with no other means of reaching the rescue plane, swam through the breakers and was quickly hauled aboard. He, too, was safely back at his base before nightfall. Final report: "All present".

Rugged Edo Floats permitting Navy scouting planes to land and take off on rough ocean water have been writing chapter after chapter in the heroic story of unrelenting effort which has snatched scores of Naval Aviators from death after they had been forced down or shot down during flight operations.

EDO
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EDO AIRCRAFT CORPORATION
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ARMY E NAVY

THE "AIR AGE"
Begins on the Ground

WIDESPREAD ACCEPTANCE of personal planes depends upon these things: planes that are easy to fly, safe, dependable and economical, *plus adequate landing facilities.* For no matter how inexpensive they may be, or how practical in other ways, the planes we fly after the war will be really useful only if we can land anywhere we want to go, close to our destination.

Every city and village in America should be planning today to furnish practical landing areas for personal aircraft. They should be close-in to town, but they may be extremely simple and inexpensive to construct—in many cases, merely an L- or T-shaped landing strip on a few acres of ground will be sufficient.

Join with the other air-minded citizens in your community today. Start planning now on the ground for the Air Age to come!

★ Have you received your copy of Aircooled Motors Corporation's Post-War Plane Questionnaire? It's your chance to specify exactly what you want in your plane. Write for a copy today!

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FINE AIRCRAFT ENGINES

AIRCOOLED MOTORS CORPORATION ★ Syracuse 8, N. Y.

In addition to the many standard SPEED NUTS, there are hundreds of other shapes and types designed to perform multiple functions and combine several fasteners into one. These SPEED NUTS, wherever used, reduce the number of parts in an assembly and eliminate the unnecessary handling of extra parts.

The patented, self-locking SPEED NUT prongs can be incorporated into almost any shape or design to meet specific assembly requirements. No other fastener possesses such flexibility of design.

SPEED NUTS may be the answer to your assembly problem. We'll gladly review your specifications and recommend a standard or special SPEED NUT for your particular requirements.

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★ *FASTEST THING IN FASTENERS*

Buy War Bonds – to Have and to Hold

Through the Roof

The whole vast area of conquered Europe is a Nazi stronghold. Massive walls and powerful fortifications defend it—all as nearly impregnable as Hitler can make them.

But overhead there are no walls. It is *through the roof* that Allied bombers have inflicted the heaviest blows on Germany's war-making machine.

To the valiant young Americans who man the Boeing Flying Fortresses, "through the roof" now has an added significance. On days when there was a thick overcast, Europe was once safe from precision bombing. Today new navigation devices enable the Fortress bombardier to hit his target through dense cloud cover with almost the same uncanny accuracy as in clear air. The first raid by the Forts on Berlin was made under just such conditions.

The deadly bombing done by the big Boeing planes has become a matter of wonder, not only to our Allies but to the enemy. After Flying Fortresses had demolished the Messerschmitt plant at Regensburg without allowing a single bomb to fall on a hospital which was practically a part of the factory area, our Eighth Air Force fliers got a special radio message from the Luftwaffe. The net of it was: "Congratulations on your accuracy. We don't know how you do it!"

The Fortress crews know the answer. It is done by cool courage, skill and training, and by the bombing stability of the steady-flying Forts themselves.

Some day Boeing's design, engineering and manufacturing skills will be turned again to products of peace. You can be sure of any such product . . . if it's "Built by Boeing" it's bound to be good.

NEW AIR FORCES COMBAT FILM

The Army Air Forces motion picture, "The Memphis Belle," shows heroic crews of Boeing Flying Fortresses in actual combat over Germany. See it at your local theater.

DESIGNERS AND BUILDERS OF THE FLYING FORTRESS • THE NEW B-29 SUPERFORTRESS • THE STRATOLINER • TRANSOCEAN CLIPPERS **BOEING**

His load could break a bomber's back

TAKE 100 LBS. OF ICE . . . spread it along the leading edge of a bomber's wing . . . and you have a perfect recipe for trouble.

Most people are surprised to learn that so little ice can be such a big flying hazard, because they think the sheer *weight* of ice is what forces a plane down. Actually it's *where* ice forms that counts.

The ice accumulates on the leading edges of wings and tail assembly. As ice builds up, it changes the contours of these edges and alters the course of air flowing over wing and tail. Since the normal course of this airflow gives a plane its lift, any change due to ice decreases lift rapidly and increases the danger of stalling.

Yet, all winter long, our planes are flying successfully through some of the worst icing conditions in the world. The B. F. Goodrich rubber De-Icer makes this possible.

If you've ever picked up an ice-glazed leaf, bent it, and noticed how the ice cracked off, you know the simple principle of De-Icer operation. De-Icers are flexible rubber strips attached to leading edges of wing and tail. When ice forms, tubes inside the De-Icer are inflated and deflated by air pressure. This causes a bending action which cracks the ice. The windstream carries it away.

B. F. Goodrich De-Icers can be installed on all critical surfaces. They comprise only a small fraction of the plane's total weight. They add a tremendous factor of safety. Without them, year-round airline operation would be impossible in many areas. Ferrying bombers to England and Russia would be impractical most of the year. And casualty reports would be grimmer after winter raids over Germany.

Introduced in 1930, the De-Icer is one of the most famous of all B. F. Goodrich "Firsts"—one of the greatest single contributions to year-round flying safety. *The B. F. Goodrich Company Aeronautical Division, Akron, Ohio.*

Skyway or Highway

B.F.Goodrich

FIRST IN RUBBER

MAKERS OF MORE THAN 80 RUBBER AND SYNTHETIC RUBBER AVIATION PRODUCTS

Official U.S. Army Photograph

Above All Else

Beechcrafters are exerting every effort to hasten the day of Victory. War Production comes before all else at Beechcraft.

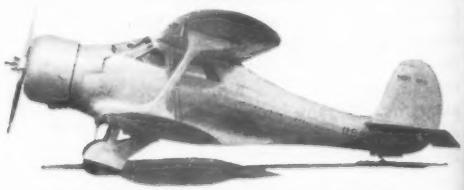
Beechcraft Bomber Trainers, Beechcraft Navigation Trainers, Beechcraft Transitional Trainers, Beechcrafts for Photographic Mapping, Beechcraft Twin Engine and Single Engine Personnel Transports—thousands of Beechcrafts are working for our Armed Forces, and still there is no let-up in Beechcrafters' determination to "Kill 'em with Production" or in deliveries off the production line.

Beech Aircraft CORPORATION

BEECHCRAFTS ARE DOING THEIR PART WICHITA, KANSAS, U. S. A.

Long Range Navigation Trainer for Celestial and Dead Reckoning Navigation Training

U. S. Army Type F-2 high altitude photographic mapping airplane



BEECHCRAFT Light Personnel Transport. Similar to Commercial D17S Biplane

AIR TRANSPORT AND THE *Future*

One of the nation's leading civilian air chiefs presents a keen analysis of post-war air travel.

By L. WELCH POGUE

Now Chairman of the Civil Aeronautics Board, having previously served as its counsel, Mr. Pogue is recognized as an authority on legal and technical problems of airline operation.

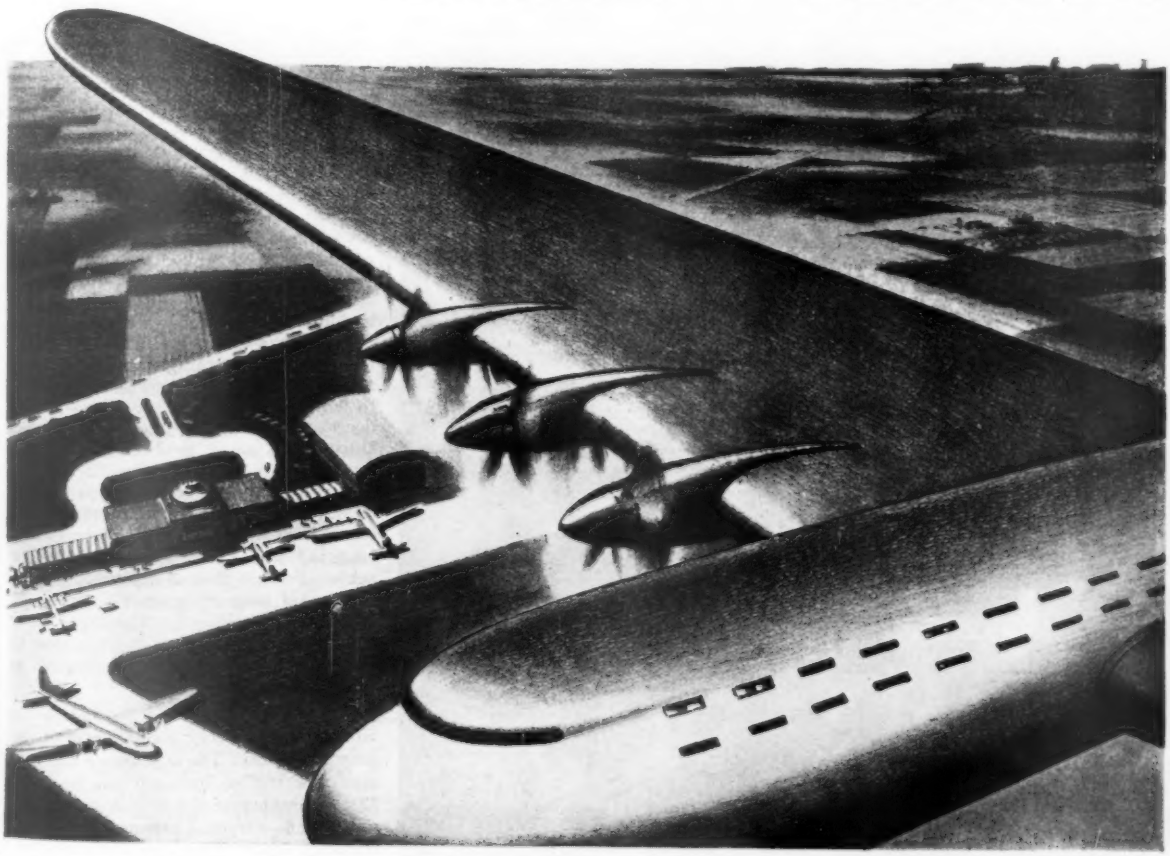
WE are at the beginning of a new era of air transport development which will have a profound, revolutionary effect in our social and economic life.

More travel for business, more for pleasure—this is the post-war future. We will travel greater domestic distances; we will travel abroad more frequently. We will know the farthest reaches of our continent and will spend two-week vacations in Europe, Africa, South America and the Orient. Daily and multi-daily air transport services throughout the world will continue the unifying trend of national and world intercommunication.

In the United States, the airplane will become the preferred common carrier for intercity travelers. Its direct benefits will be extended to many small cities; there will be increasing community of interest and traffic between them. This route expansion will contribute to the flow of travel along main lines; the new regions thus served will supply increased foreign trade.

Air transport will draw from and also supplement other forms of transportation. More important, it will create traffic.

As aircraft and operating efficiency improve, rates certainly will drop. This ap-



An artist's conception of a typical airliner of the future, dwarfing in size, speed and load today's air transports.

plies to passenger, air mail, express and freight rates—domestic and foreign.

Present knowledge, of course, is not sufficient to make detailed, accurately-timed predictions, but I regard these as reasonable probabilities in the decade following the war. They are made in light of present and foreseeable technological achievements. They also are made with the knowledge that unpredictable shift and development in travel and shipping habits may take place. The effect of the speed and flexibility with which we are dealing may be greater than in any other time in transportation history. The full strength of these forces have yet to be measured.

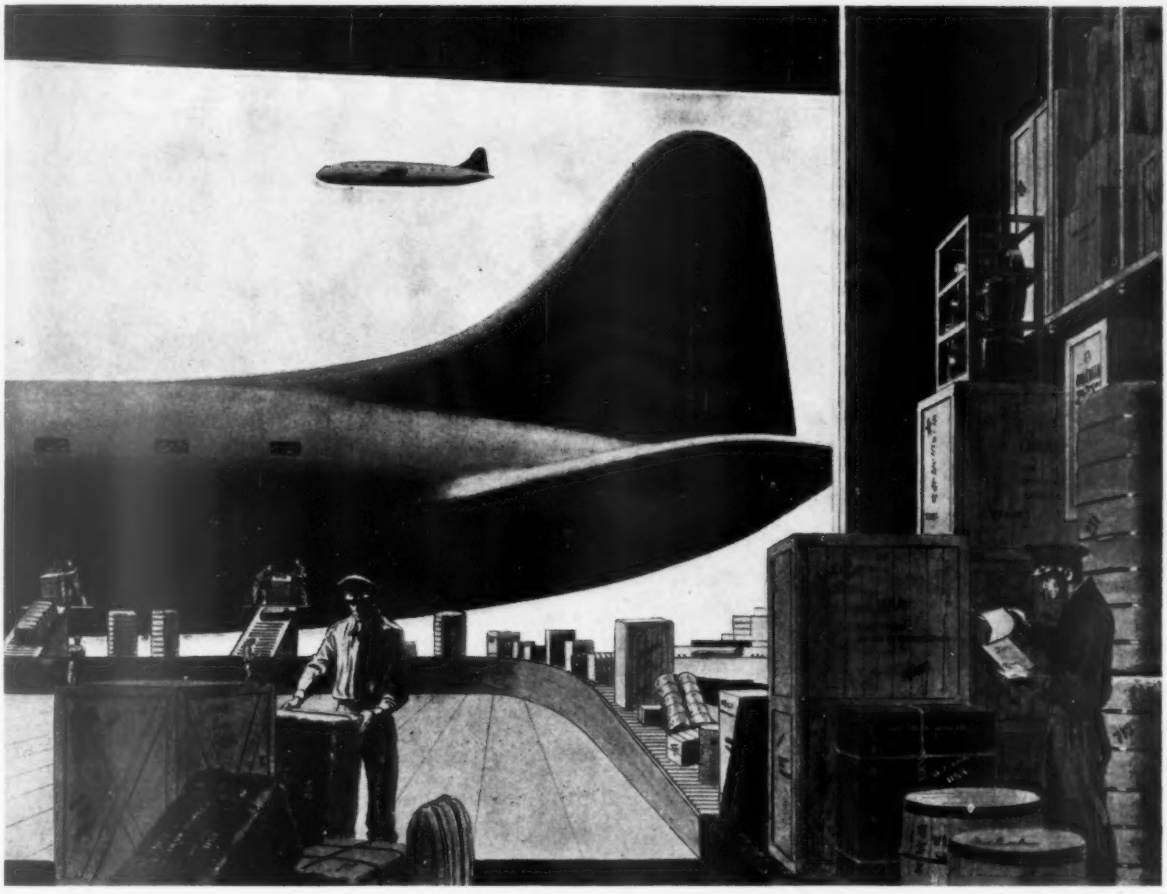
It seems to be a well-established American custom for the prophets of the future of air passenger transport to take current statistics relating to land and water travel and to assign a certain percentage to the air. In my opinion, this method requires vigorous correction. It fails to consider the history or the character of volume passenger travel.

In 1855, 38,000,000 passengers were carried by the railroads in the United States. In 1882, a little more than a quarter of a century later, the number had increased nearly eight times to 289,000,000. The average passenger-miles per capita increased from 114 in 1880 to a yearly average of 177 in the period 1882-1890. In the decade 1901-1910, the increase was to a yearly average of 294 and in the five-year period 1911-1915, to a yearly average of 354. During this same period the average length of journey was increased from 25 to 33 miles.

This was railroad travel only. A new mode of travel appeared at the turn of the century. In 1900 there were 8,000 passenger cars, buses, and taxis in the United States; in 1910, 459,000; in 1915, 2,310,000. Even during this early period the automobile undoubtedly took some traffic from the railroads and its absorption of some short-haul traffic may have contributed to the increase in the average length of passenger journey on the railroads, but its influence was probably at a minimum.

It was not until the 1921-1930 decade that the yearly average railroad passenger-miles per capita decreased—dropping to 301. In the decade just passed they decreased to a yearly average of 163. During the same periods the average journey increased to 39 and 43 miles respectively. This decrease in passenger-miles per capita and the extraordinary increase in average journey on the railroads were indications that the automobile had achieved a high level of utility. Extensive systems of intercity roads became available. The number of passenger cars, buses, and taxis grew from 2,310,000 in 1915 to 8,226,000 in 1920; 23,059,000 in 1930; and 27,435,000 in 1940.

But the railroad traffic flowing to the automobile was only a small part of the automobile total. The automobile had created new traffic. Intercity bus traffic in 1933 amounted to 3.4 billion passenger-miles and intercity private automobile traffic to 184.9 billion passenger-miles, a total of 188.3 billion. Based on the average population between 1931 and 1940,



In air cargo operations of the future, the airplane will carry freight to and from factory landing strips. This will hasten development of industrially remote, inactive areas. Air cargo rates are expected to decrease gradually to around 15 cents a ton-mile.

this amounts to 1,480 passenger-miles per capita a year. Including railroad traffic, annual per capita passenger-miles in continental United States had increased over ninefold in a period of approximately 50 years.

In overseas travel by ship, the growth was equally remarkable.

This is the current of travel activity into which air transport was cast. Up to the present, the number of passenger-miles by air has been almost infinitesimal compared with the total by other forms of public transportation. This is because air transport is new.

Many errors of prediction have been made because of the failure to recognize this absolute newness of air transport. In the United States only 5,782 passengers were carried on the domestic airways system in 1926; only 8,661 in 1927. But nine years later, in 1935, the number of passengers had jumped to three-quarters of a million. Revenue passenger-miles increased 267 per cent in the period 1936-1941, from 321,000,000 in the fiscal year ended June 30, 1936, to 1,178,000,000 in 1941.

Air travel to overseas destinations has also continued its growth. From 1929 to 1938 straight through business depressions, departures from the United States increased from 4,000 to 25,000 per year.

All these growth trends will resume at the close of the war. A comparatively small unit, the airplane can establish several schedules within the hour rather than within the day. A number of departures for oversea points can be had within the day rather than within the week.

The most striking domestic contribution which will be made by air transport will be the development of long haul traffic. Internationally, its greatest contribution will be to strengthen and develop new communities of interest between nations remote in miles but close in hours.

I have not meant to imply that the growth of airplane use will be limited to long journeys. In the United States in September, 1940, the average length of a journey by air was only 464 miles. Half the passengers traveled only 250 miles or less; three-quarters traveled less than 400 miles and nine-tenths less than 750 miles.

The growth of traffic between closely situated metropolitan centers was tremendous. The number of passengers traveling less than 150 miles had increased 177 per cent over November, 1939; growths such as this weighted the average. Nevertheless, the average journey increased for two-thirds of the cities. The short-haul growth is additional evidence of the overwhelming importance of time and speed in travel.

On the other hand, neither should the tremendous increase in short-haul traffic be construed as an indication that a major air passenger transportation field exists in the extremely short-haul market. This market is at present outside the sphere of air transport's greatest economic utility. Until airplanes can make landings in the centers of cities, the convenience and time advantage of air transport would be lost in frequent-stop travel. Surface transportation, especially the private automobile, is more convenient and speedier in the short journey to a nearby city.

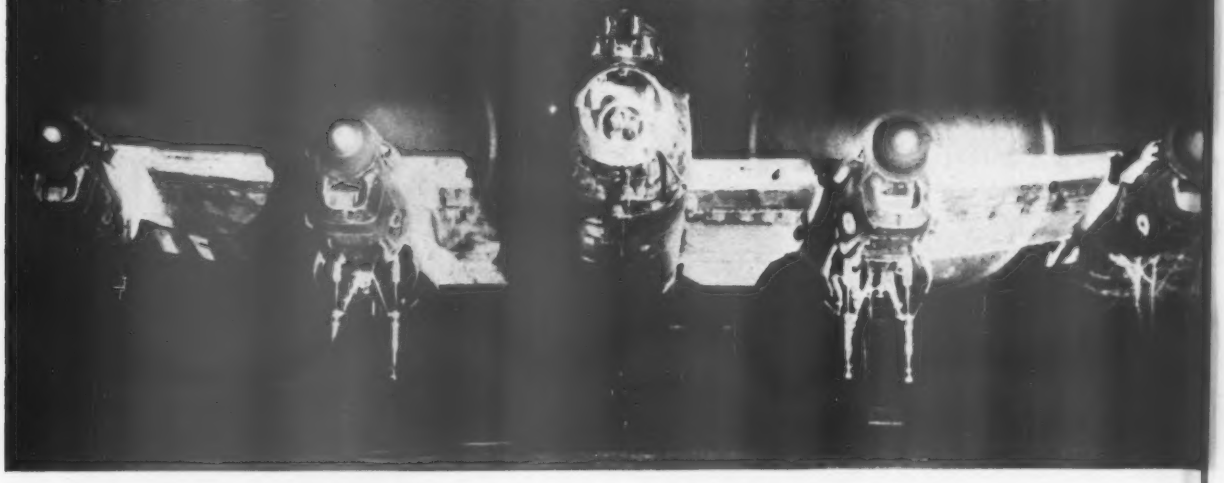
The most significant social and economic effects of the airplane will arise from the extension of the average length of pleasure and business journeys. The trend is an historical one, its pace set by the facility and speed of air transport.

Markets, distant in miles, are already as close in point of the business man's time as only 800 or 1,000 miles by rail. Social and pleasure travel may also be accomplished within a nation or the world in the same or a shorter span of time than it is now by surface transportation in many provinces and states. The cultural centers and the vacation grounds of a nation or the world can be at every man's feet within a matter of hours.

Another important aspect of this unify-

(*Continued on page* 144)

The PATHFINDERS



The Avro Lancaster III is one of several RAF types used for Pathfinder operations.

Pathfinder uniform insigne.

Using secret operational, navigational and target identification techniques, the RAF Pathfinders illuminate areas to be bombed.

By
KENNETH R. PORTER

FLYING'S European War Correspondent
LONDON.

THE Pathfinders light the RAF's way to Germany. Though their story still is highly secret, it is no secret that Britain's whole theory of strategic bombing is based upon these night-flying couriers of doom. No secret either to Nazis inspecting the ruins of their cities or to fast RAF photo planes taking pictures of "mission accomplished" is the result of Pathfinder operations.

The Pathfinders precede the big RAF night bombing flights, outlining with flares the targets upon which the bombers dump their explosives. Since the development of Pathfinder operations, the old technique of visual bombing, in which the pilots swooped down to chimney-top level to identify their targets, has become obsolete. Out of Pathfinder operations has grown the RAF saturation bombing technique of mass flights dropping the greatest possible weight of bombs upon the target in the shortest possible period of time.

Ground defenses and fighters have tended to drive bombers higher and higher. Given the RAF's theories of area bombing to disrupt communications and virtually blot out whole cities, the concentration made possible by Pathfinders swamps ground defenses at the same time it swamps the bombing objective. Concentration serves also to reduce the vulnerability of bombers to fighter attack.

Bombing nowadays must hit the target under all weather conditions. So successful are Pathfinder operations in overcoming visibility restrictions that the RAF Bomber Command now actually prefers to attack on moonless, cloudy nights.

Pathfinder forces can penetrate deep into enemy territory at night to locate precisely not only the city for which they are heading, but the specific part of it which is their target. They can do this through thousands of feet of cloud and so accurately that the heavy bombers can hit their objectives with extreme accuracy.

Air Vice-Marshal Bennett.

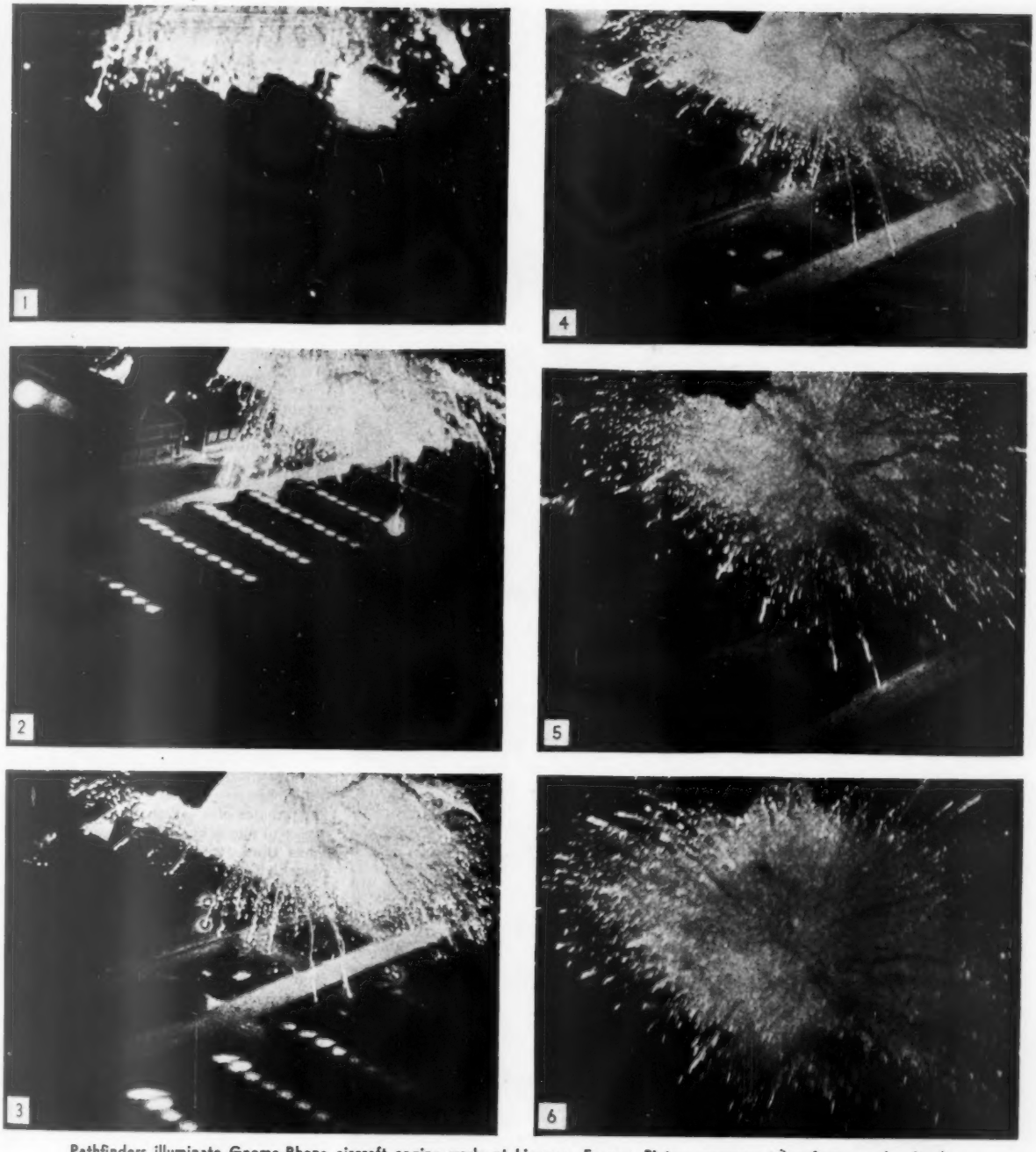
The targets are identified by quick-burning pyrotechnics known as "sky markers." These are replenished at intervals throughout the attack so that possible late arrivals will not be misled. There may be absolutely no visibility from operational height, yet the Pathfinders accomplish their miracles with special navigational aids, outlining target areas with specific indicators so that the escorting bombers can release their loads dead on the objectives.

The sky markers are of various kinds. Some are so vividly illuminating that they can be seen at night from the sub-stratosphere through almost complete cloud cover. There are luminous parachute flares, luminous float bombs, flare clusters, Bengal lights (mixed colors) and ground markers. Combinations of many colors and varied types of flares are used. Depending upon the target and code for the night they might be released in clusters of red, blue, green or mixed to indicate the objective zone on the ground.

White magnesium flares, known as "drips," may also be used in conjunction with these colors. The flares themselves may be discernible through almost ten-tenths cloud. Bombardiers might see nothing through their sights but this floating rainbow and yet so accurate is the flare laid down by the Pathfinder that the bombs score perfect hits. The Pathfinders use special mechanical devices for calculating wind speeds to allow compensation for drift. The job of dropping flares calls for marksmanship at least as precise as bombing itself.

The colors and types of flares used are altered daily against the possibility of the enemy imitating them for decoy purposes. The Nazis also would have difficulty imitating the chemical components.

In the two years of planning and research in which the flares and Pathfinder technique have been under intensive de-



Pathfinders illuminate Gnome-Rhone aircraft engine works at Limoges, France. Picture sequence taken from very low level shows marker bomb illuminating target. Attack was carried out by Lancasters in bright moonlight through a clear sky.

velopment, the flares and indicators have been made so light in weight that a nearly normal bomb load can be carried by the various types of Pathfinder planes used. Thus additional striking force is added to the Pathfinder mission.

Air Vice-Marshal D. C. T. Bennett, 34-year-old pre-war commercial airline pilot, commands the Pathfinder force. He is the first man to wear on his left breast pocket below his wings the coveted golden eagle insignia of this branch of RAF Bomber Command. His knowledge of aerodynamics, astro-navigation and allied sciences made him invaluable for the assignment.

Christened by Air Chief Marshal Sir Arthur Harris, the Pathfinder force of Bomber Command was organized August 15, 1942, and undertook its first operation only three days later. Pathfinder techniques, however, were used prior to that date in experiments which paved the way for Pathfinder operations.

The whole Pathfinder technique was developed out of an improved navigational technique which made it possible for navigators to locate their targets so certainly and with so little delay—even on moonless nights—that the 1½ hours allowed for the whole bomber force over the target was reduced to less than 30 minutes. From this time on, "saturation" in bomber attacks became a fact. The RAF adopted the new navigational methods and the Pathfinders came into being.

Major bombings in the early summer of 1942, as in all previous offensives, were still carried on in bright moonlight. One

Bomb aimer in nose of Lancaster. His accuracy is greatly improved because flares dropped by Pathfinders illuminate the target. Pathfinders also carry a bomb load.

Pathfinders over Berlin. Target indicators (A) have been dropped close to Stettiner station (B) among existing fires marked by less prominent trails. Bomb bursts at (C).

of the brightest nights of the year illuminated the 1,000-bomber attack on Cologne. An extremely heavy and successful moonlight attack was made on Dusseldorf on July 31, 1942.

But on September 10, 1942, shortly after the Pathfinder force was formed, every available aircraft was assembled for a raid on the same city on a dark, moonless night. The success was amazing. The new tactics made the Bomber Command virtually independent of the weather and gave bombers a new defense against night fighters by operating in complete darkness over protective clouds which even searchlights could not penetrate.

Pathfinder techniques were steadily improved during the winter of 1942 and the spring of 1943, when four-engined bombers began the task of destroying the economic life of Germany's main industrial cities. Prior to this time truly accurate, heavy and concentrated attacks on the Ruhr had proved impossible because of the industrial haze which shrouded the valley like an artificial smoke screen. Brilliant target indicators dropped on Essen and the Krupps works penetrated the smoke without difficulty. Even when an actual smoke screen was laid thick over Peenemunde the accuracy of the Pathfinders was not hampered.

As Pathfinder activities expanded, the battle of the Ruhr also took in Duisburg, which was successfully bombed when the targets were completely invisible beneath ten-tenths cloud. Essen was attacked twice. Remscheid and Krefeld received knockout blows in a single attack beneath similarly obscuring clouds.

The RAF soon found that the Pathfinders made possible a greatly increased number of sorties without a corresponding increase in front-line strength. Independence of weather meant many more nights of operational flying. Considerably more than twice as many sorties were recorded in the first quarter of 1943, after the development of Pathfinder tactics, as in the same length of time in 1942, although front-line aircraft strength certainly had not doubled. These months are regularly proven to be the most unfavorable for night operations.

By the middle of 1943, it was obvious that all western Germany, up to and including the Ruhr, was at the mercy of Bomber Command. Only exceptionally bad weather in England or over Germany could hold up the raids. The Pathfinders were not yet, however, prepared technically or tactically for such a task as bombing Berlin. Most of the rest of the year was spent in gaining the accuracy, independence and protection necessary to carry the battle east from the Ruhr

Pathfinder tactics proceeded swiftly. The near destruction of Hamburg brought the bombers within 150 miles of Berlin, but Hamburg was especially favorably located for Pathfinder tactics, being located on an easily-identified estuary. The brilliant attacks on Kassell and Hanover, though not so far from base as Hamburg, represented a new advance because both are far inland. The sphere of operations then moved into south Germany and the upper Rhineland.

(*Continued on page* 100)

NEW GIANT

Projected Douglas DC-7 could be powered by four 3,000-h.p. engines, giving it a range of 4,000 miles.

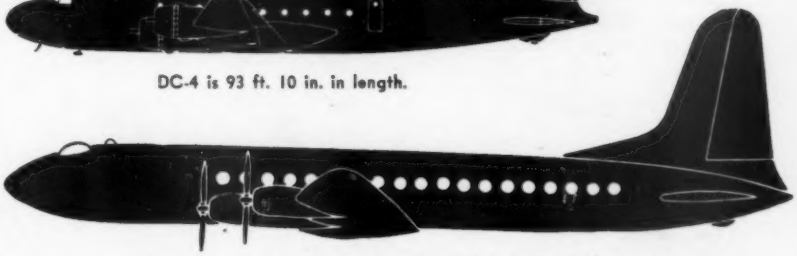
By
GAITHER LITTRELL
FLYING's Western Editor

Douglas DC-7 will transport 86 passengers at 400 m.p.h.

IN the mysterious confines of the restricted area of the Long Beach plant of the Douglas Aircraft Company today stands a graceful wooden airplane—a mockup of a future plane that Douglas believes will be the answer for commercial airlines plying transoceanic routes after the war.

Official Douglas designation of the super-transport is DC-7—Douglas Commercial design No. 7, latest in a famous series of Douglas transports. The DC-1 was the prototype of the twin-engined DC-2, which at one time was the standard airliner in the United States. The twin-engined DC-3 followed in 1934 and still is used in larger numbers than all other transport types in the world put together. The DC-4 is the four-engined, tricycle-geared *Skymaster*, hurriedly converted to military use after Pearl Harbor and now serving the Army Air Forces as the C-54 passenger version and C-54A (cargo version); in the Navy, the *Skymaster* is designated R5D.

DC-4 is 93 ft. 10 in. in length.



DC-7, shown to the same scale as the DC-4, is 123 ft. 4 in. long.

The DC-5 was a two-engined, high-wing, tricycle-geared design, several of which were sold to KLM, the Dutch national airline; a number also still are used as transports in the U.S. Navy. The DC-6 is a proposed twin-engined, low-wing, tricycle-geared monoplane which looks very much like the *Skymaster* and appears intended as a new twin-engined design to replace the DC-3.

(*Continued on page* 156)

The FLEET

Supermarine Seafire, British navy counterpart of the Spitfire, flies over H.M.S. Indomitable, which joined fleet in 1942.

AIR ARM . . .

Organized much like U. S. Naval aviation, the British Naval Air Service is an integral part of the Royal Navy.

THE British Fleet Air Arm has become something more than a name to the average American since Capt. Caspar John, British Naval Attache for Air, recently announced that one-third of all British Naval flyers are being trained and equipped in the United States.

Since 1940, Captain John said, British boys have been trained here in 12-month courses, in American planes with American instructors. They go directly into combat theaters in American planes from American-built carriers manned by British crews.

Many British naval aviation officers also are in the United States working closely with Adm. John S. McCain, Captain John revealed. "What we really have over here is a miniature replica of the British Fleet Air Arm, and anything we do in England is tied up with American methods," he said.

The so-called "Fleet Air Arm" is really the British Naval Air Service, an integral part of the Royal Navy. The name, "Fleet Air Arm," dates from the time when naval aviation was under the dual control of the Navy and RAF. Since 1938, however, it has been entirely under the Admiralty, though the RAF Coastal Command retains operation of flying boats and shore-based aircraft engaged in sea duties.

The Fleet Air Arm has had a record of brilliant victories since the war started. It has played an important role in every major fleet engagement: the battle of Matapan, where the FAA wiped out a large portion of the Italian Navy at sea after its torpedo planes had blasted Taranto harbor; the sinking of the *Bismarck;* the hounding of the *Graf Spee;* the protection of Allied landings at Salerno. At Dunkirk a squadron of naval planes carried out daily dive-bombing attacks on enemy troops and tanks.

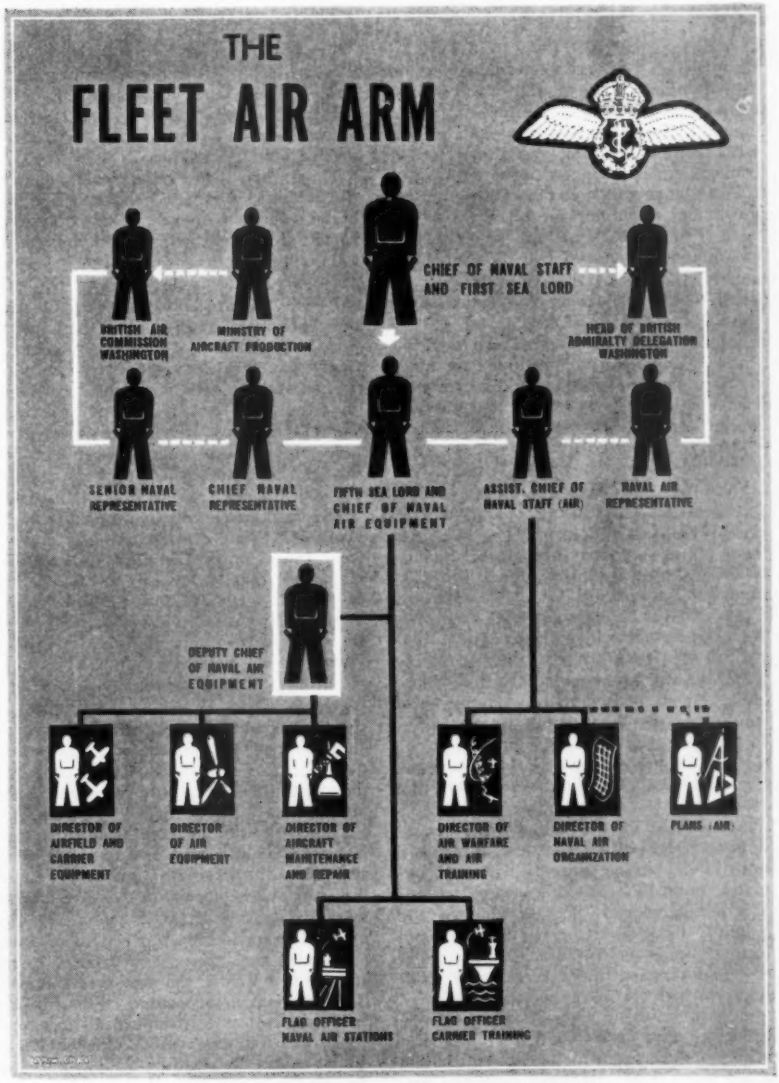
Since all priorities went to the RAF during the Battle of Britain, the British Naval Air Service started the war with a shortage of planes. Mainstay at first was the Fairey *Swordfish*, a slow sturdy biplane affectionately nicknamed the "String-bag." The *Swordfish* is powered by a nine-cylinder, 690-h.p. radial engine, has a maximum speed of 154 m.p.h. and cruises at 131 m.p.h. Carrying an 18-inch torpedo or bombs, it has accounted for over 500,000 tons of enemy shipping since the outbreak of the war and was used at Taranto and Matapan and in pursuit of the *Bismarck.*

The Supermarine *Seafire* was used as a land fighter before being taken to sea. It is the famous *Spitfire* with sea legs. Adapted for carrier operations it was given catapult spools, deck arrester hook and other specialized equipment including folding wings. It is powered by a Rolls Royce *Merlin* liquid-cooled engine giving it a speed of 375 m.p.h. at 21,500 feet. Armament includes four .303 machine guns and two 20-mm. cannon.

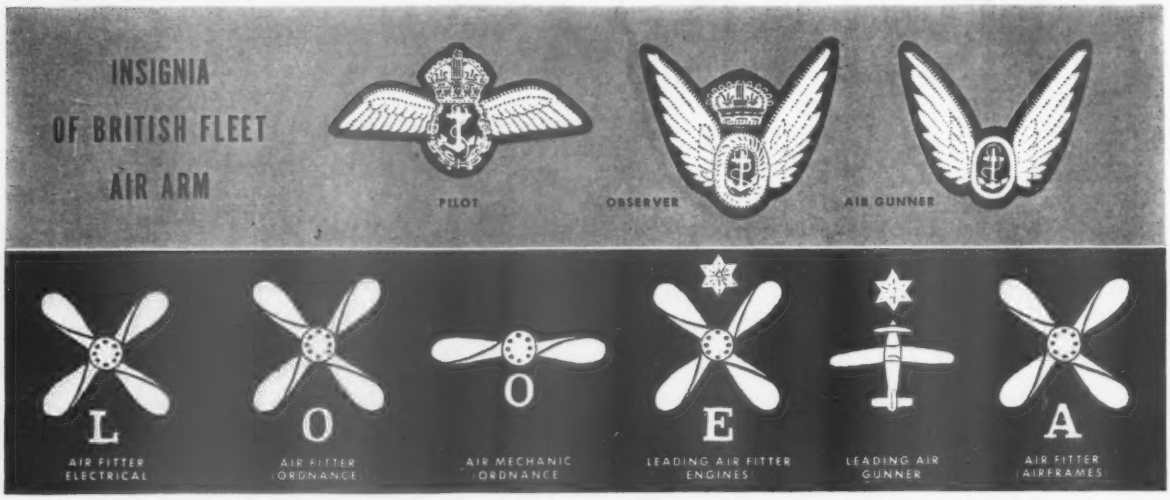
Newest British torpedo plane is the Fairey *Barracuda*, powered by a *Merlin* engine developing 1,260 h.p. at 8,750 feet. It has a 49-foot wingspread, carries two or three men and a bomb load up to 2,000 pounds. A single torpedo is carried externally.

Among U. S. planes turned over to the British Fleet Air Arm are the Vought *Corsair*, Grumman *Wildcat*, *Hellcat* and *Avenger*. British authorities praise the latter as "probably the world's best torpedo plane."

During the first six months of the war, in accordance with general pre-war theo-


THE
FLEET AIR ARM
CHIEF OF NAVAL STAFF AND FIRST SEA LORD
BRITISH AIR COMMISSION WASHINGTON
MINISTRY OF AIRCRAFT PRODUCTION
HEAD OF BRITISH ADMIRALTY DELEGATION WASHINGTON
SENIOR NAVAL REPRESENTATIVE
CHIEF NAVAL REPRESENTATIVE
FIFTH SEA LORD AND CHIEF OF NAVAL AIR EQUIPMENT
ASSIST. CHIEF OF NAVAL STAFF (AIR)
NAVAL AIR REPRESENTATIVE
DEPUTY CHIEF OF NAVAL AIR EQUIPMENT
DIRECTOR OF AIRFIELD AND CARRIER EQUIPMENT
DIRECTOR OF AIR EQUIPMENT
DIRECTOR OF AIRCRAFT MAINTENANCE AND REPAIR
DIRECTOR OF AIR WARFARE AND AIR TRAINING
DIRECTOR OF NAVAL AIR ORGANIZATION
PLANS (AIR)
FLAG OFFICER NAVAL AIR STATIONS
FLAG OFFICER CARRIER TRAINING

Direction of FAA rests solely with Admiralty. Board member responsible is the Fifth Sea Lord.



British navy pilots wear wings on left sleeve just above top row of gold braid when dressed in blue. In summer khaki and whites the wings are worn on left breast as in U. S. Navy. Insignia in lower row are worn on sleeves of ratings (enlisted men).

ries, British carriers were employed on the assumption that they were best adapted to use on the open ocean, far removed from enemy land-based air power, with duties including the protection of convoys and working with the fleet.

Fleet work called for the additional requirement of being able to strike at the enemy fleet. Such action, however, was not thought of as a mortal blow but as a means of reducing the enemy's speed to assist British surface ships in establishing contact.

The invasion of Norway changed all that. It demonstrated the need for more carriers provided with the highest performance single-seater fighters capable of landing on a deck. They had to protect not only the carrier itself but other units of the fleet.

Reconnaissance was one of the earliest duties of the Fleet Air Arm and remains one of the most important. The Fleet Air Arm points out that air reconnaissance has not altered the principles of sea warfare but has greatly enlarged its scope. Upon receipt of a report the Fleet Air Arm is sent immediately into action. Flying up to a range of 200 miles from the fleet, reconnaissance aircraft investigate such reports or search out enemy shipping. Sometimes this takes months, as in the case of the *Graf Spee*, or it may be a short intensive hunt as when aircraft from the *Ark Royal* tracked down the *Bismarck*.

A function closely allied with reconnaissance is spotting for fleet gunfire on both land and sea targets. This is especially important in long-range actions. The assistance of aircraft enables the ships to use indirect fire advantageously. Fighter escort is provided the spotters if necesssary. Spotting aircraft may drop flares at night to light the target.

Britain has used aircraft carriers since the early days of World War I. The first accommodations for planes aboard British ships were platforms built over the forward gun turret. One of the earliest flights from a ship at sea was made from the battleship *Hibernia*, steaming at 12 knots. There was no way for planes to land on the ship, however, and they had to come down alongside and be hoisted aboard by derricks.

The first British carrier was the old *Ark Royal*, later renamed *Pegasus*. She was laid down as a merchant ship but converted to a carrier before launching. Later the speedy cross-Channel packets *Empress*, *Engadine* and *Riviera* were fitted with hangars and cranes for hoisting the seaplanes into and out of the water.

In 1916, the record-breaking Cunarder, *Campania*, was converted. Her forward funnel was replaced with two funnels set on either side and a runway was built down to the bow. Seaplanes mounted on light trolleys flew down this runway and dropped the trolleys as they took the air. They still had to land in the sea, however.

The first carrier to operate landplanes was the *Furious*. In August, 1917, Squadron Commander Dunning successfully brought his plane down on her flight deck for the first British deck-landing at sea. Dunning was killed a few days later when he repeated his experiment and his plane went over the bow.

The first ship especially designed as a carrier was the *Hermes*. She carried 15 planes but, like her predecessors, was too slow to create sufficient wind over her decks or to regain her position with the fleet after turning into the wind for flying operations.

The *Eagle* was the first "island" carrier. Her two funnels, bridges and masts were shifted to the extreme starboard. Later the *Furious*, *Courageous* and *Glorious* were transformed by clearing off the upper works and building two hangars, one above the other. Last carrier to be constructed before the war was the *Ark Royal*, which incorporated such features as accelerations for catapulting, an emergency crash barrier, and arrester wires which could be raised or lowered hydraulically to facilitate deck landings.

British carrier losses have been heavy in the war. On the day war was declared the Royal Navy had eight carriers at sea in the following positions: the *Ark Royal* and *Courageous* with the Home Fleet; the *Glorious* in the Mediterranean, the *Eagle* on the China Station, the *Furious* used in deck-landing training, the *Hermes* on submarine operations in home waters, the *Argus* and *Albatross*, also in home waters.

First loss was the *Courageous*, sunk by a submarine in September, 1939. The *Glorious* went down before enemy fire in June, 1940. These ships were replaced by the new *Illustrious* and *Formidable*. The *Victorious* was commissioned in May, 1941; the *Ark Royal* was torpedoed the following November.

The *Indomitable* joined the fleet in 1942. In April, 1942, Japanese dive-bombers sank the *Hermes* off the Ceylon coast. The *Eagle* was destroyed on Malta convoy in August.

Except for the *Ark Royal*, however, all these losses were old ships. Replacements of four new 23,000-ton carriers made the Royal Navy's carrier strength far greater than at the beginning of the war in tonnage and accommodations for aircraft.

The accomplishments of carriers in the Mediterranean are particularly noteworthy. The clear skies of this area during most of the year caused heavy losses in surface ships but the British successfully operated carriers which contributed materially toward saving the Middle East. Aircraft carriers played a leading role in getting convoys through to Malta even though the fighters available were obsolescent or obsolete.

Work of the Fleet Air Arm in reconnaissance and spotting is also noteworthy. One of the most exciting chases was the interception in March, 1941, by *Swordfish* from the *Ark Royal*, of two British ships, the *San Casimiro* and *Bianca*, which had been captured by the *Scharnhorst* and *Gneisenau*. The two British ships were scuttled but *H.M.S. Renown* took off the imprisoned British crews and the German prize crews.

No reconnaissance by naval aircraft has ever contributed more to the success of

large scale operations than the flight which brought back information of the departure of the German battleship *Bismarck* and the heavy cruiser *Prinz Eugen* from Bergen, Norway. This intelligence, gathered in the face of almost impossible weather conditions and despite intense antiaircraft fire, led to the pursuit and sinking of the *Bismarck*.

The first time aircraft were used in gunnery spotting was in the Battle of the River Plate, involving the German warship *Graf Spee*. After the enemy opened fire at a range of nearly 10 miles, the *Ajax*, carrying two Fairey *Seafox* seaplanes, launched one of her aircraft. The morning was clear and the *Seafox* climbed to a cloud base at 3,000 feet. Meanwhile, with the two other British cruisers, *Achilles* and *Exeter*, the *Ajax*, rapidly closed the range.

The engagement became a chase, the *Ajax* and *Achilles* relentlessly dogging the *Graf Spee* after the *Exeter* had been badly hit. The *Seafox* spotted for both cruisers, enabling them to continue rapid and accurate fire, then signalled: "Torpedoes approaching. They will pass ahead of you." This advice enabled the British commodore to alter his course in time.

Shortly after midnight the *Graf Spee* sought refuge in Montevideo. While she was there, the *Seafox* made a daily reconnaissance, taking care not to fly over territorial waters. At 8:45 p.m. December 17, the *Seafox* signalled: "*Spee* has blown herself up."

The British Naval Air Service is responsible for operating all shipborne aviation in the Royal Navy. Operations are carried out by naval officers and enlisted personnel in the same way as in the United States Navy. In England, primary and intermediate pilot flight training is given at schools administered by the RAF. This achieves a common basic doctrine for all British aviators.

Following basic, the naval pilot candidate goes through a tactical school and practices deck-landings in the type of plane he will fly in combat. These courses are conducted by the navy at naval air stations.

An experienced British pilot is stationed at each U. S. Naval air station training British naval pilots. This enables co-operation and exchange of views on training and tactical applications.

Upon entering advanced training, all students qualifying are commissioned in the ranks, depending on age. These ranks include: temporary midshipmen, (A) RNVR; temporary acting sub-lieutenant, (A) RNVR; or temporary sub-lieutenant, (A) RNVR. The (A) designates aviation

(*Continued on page* 158)

A Fairey Albacore takes off from crowded deck of the 23,000-ton carrier Indomitable on Malta convoy. Hawker Sea Hurricane, in foreground, is on deck of Victorious from which this picture was taken. In background is the Eagle.

THE NAVY'S AIRLINE

By JOSEPH A. BORS

THE planes of the Naval Air Transport Service are following America's great fleets to victory. The pilots and crews of at least 10 squadrons now carry vital supplies and personnel to and from the war zones over a world-wide transoceanic and overland network of more than 65,000 miles.

Expansion of the NATS, from nothing after the Jap attack on Pearl Harbor to a vast organization undreamed of in peacetime, is a tribute to Yankee ingenuity and production. Some of the major accomplishments included:

1. Moving critical supplies, materials and personnel quickly to assure maximum efficiency of operation for U.S. fleets operating in waters throughout the world.
2. Returning to the United States thousands of pounds of critical war materials, such as mica, tantalite, natural rubber and other goods.
3. Developing new or improved transport techniques in co-operation with commercial airlines which should prove valuable in post-war aviation.
4. Providing information on weather and terrain from areas over which planes had never flown prior to World War II.
5. Improving packaging facilities to insure maximum payload in the necessarily limited cargo space available on planes.

These are only a few of the highlights on the scope and development of NATS, which is to the Navy what the Air Transport Command is to the Army.

There is little difference between the functions of the two branches, except that services performed by the NATS are more specialized and on a smaller scale than those of the ATC.

The NATS insigne.

The latter operates on a much larger scale mainly because of the size of the Army and, in addition, handles a great amount of material under Lend-Lease for Allied governments.

NATS operates only where the Navy has a direct interest and its organization must be flexible enough to permit quick route changes in the event that the fleet moves into an entirely new war zone, as it did recently in the Marshalls.

Just how important are the functions of NATS is indicated by the fact that it is carrying an average of 22,500 priority passengers and 8,300,000 pounds of cargo and mail per month. The squadrons are flying an average of 3,600,000 plane-miles each month.

During the last half of 1943, NATS increased its operations 70 per cent over the first six months of the year and is continuing to expand its operation and enlarge its training program—the latter partly through contract services by Pennsylvania-Central Airlines, American Airlines, Pan American, American Export and United Air Lines. Despite the difficulties and hazards of wartime flight, the Navy declares that the NATS has achieved an efficiency and dependability equal to that of the pre-war civil airlines.

In addition to operating 10 squadrons of its own, NATS also uses the facilities, under contract, of Pan American Airways and American Export Airlines. Pan American flies NATS schedules in the At-

NATS flies 3,600,000 plane-miles per month over 65,000-mile network, carrying 22,500 passengers and 4,150 tons of cargo.

World's largest flying boat, the Mars has smashed records, now is flying for NATS. Twenty planes of a modified version are being built.

Casualties of Central Solomons campaign against Japs are loaded aboard NATS Skytrain for flight to base hospital.

lantic and Pacific and from the United States to Alaska and South America. American Export's NATS contracts are for transport along Atlantic routes from this country to Alaska and South America.

Much of the credit for the efficient NATS organization must go to the commercial airlines which loaned expert personnel and facilities to the Navy to speed up movement of cargo in the early months after Pearl Harbor.

Reserve officers with previous airline experience, designated "Air Transport Officers," have been assigned to most Naval establishments served by the NATS. Other experienced ex-airline officers have been assigned billets in the operations and engineering departments. The term "flight officers" is simply Navy's counterpart for the airlines' "chief pilot."

A Navy innovation has been the flight orderly, an enlisted man assigned to each plane in transit. He is trained to load the plane properly and tie down the cargo; to handle the paper work necessary in manifesting cargo and passengers for each flight; and to act as a steward throughout the flight. Flight orderlies are given a special Naval rating as recognition for outstanding work in the squadron.

Under the present setup, NATS operates under three wing commanders in the Atlantic, the West Coast and the Pacific. A fourth wing commander heads the Naval Air Ferry Command which moves new planes from factories to training centers and starts them for war zones.

According to the Navy, the Atlantic wing commander has charge of flights on the east coast of the United States to the British Isles, Iceland, South America and Africa.

Under the west coast wing commander come all transcontinental NATS flights from the east coast to San Francisco, and from the west coast north and west to Alaska and the Aleutians.

Greatest task falls to the Pacific commander who operates flights from the west coast to Hawaii and from there to the Central, South and Southwest Pacific war theaters and to Australia and New Zealand.

The main routes now being flown by the NATS are:

The Pacific flying boat operation which extends from Alameda, Calif., to Pearl Harbor and southwest through the Pacific to Australia. The NATS today makes this trip in three days. Traffic on the main route must remain a military secret for the time being.

The landplane operation to Alaska and the Aleutians. Douglas *Skytrains* and *Skymasters*, especially equipped and winterized, are flown by crews trained to cope with weather hazards of the area between the Naval air stations at Seattle and Kodiak and more advanced Aleutian bases.

Inland from the west coast, NATS landplane schedules are operated between Naval air stations at Oakland, Alameda, San Diego, and Patuxent River, Md., and New York. At the latter two points these schedules mesh with NATS operations from east coast Naval stations.

East coast landplane schedules extend

Incoming freight aboard NATS flying boat is checked by transportation officer. In last half of 1943, NATS increased operations 70 per cent over first half of year.

from Newfoundland through Boston, New York, Philadelphia, Washington, D. C., Norfolk, Charleston, Jacksonville Pensacola, and New Orleans to Corpus Christi.

A summer NATS service goes to Greenland and Iceland.

Another east coast route leads south from Norfolk to Naval establishments at Guantanamo, Cuba; San Juan, Puerto Rico; Antigua, St. Louis, Trinidad, and along the east coast of South America to Natal and Rio de Janeiro, Brazil.

Also from New York, Patuxent river and Miami, NATS flying boats are in scheduled service through Miami, Great Exuma, Bahama; Guantanamo, Cuba; Portland Bight, Jamaica; Coco Solo, Canal Zone; and San Juan, Puerto Rico.

A newer route includes service from the United States to Africa by way of South America and across the South Atlantic.

From each of all the foregoing routes extend many feeder lines particularly in the Pacific and the Caribbean.

The primary ferry route operated by the Naval Air Ferry Command wing of the NATS runs through Lynchburg, Nashville, Little Rock, Fort Worth, El Paso and Tucson.

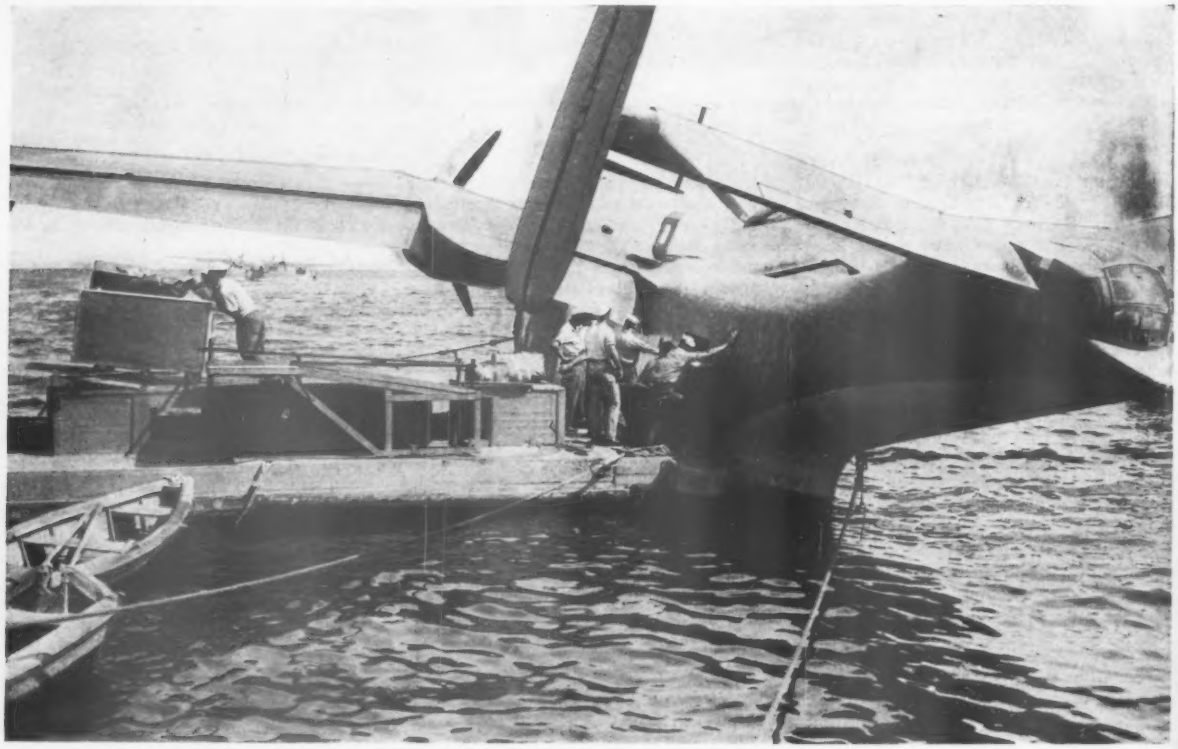
It has been necessary to establish a priority over all air transport, military and commercial, to assure that the more urgent traffic could be moved promptly and to enable handling of the remainder in its relative order of importance.

Control and administration of the air priority system is shared by the Navy and Army. The Navy controls priorities for NATS transatlantic, Pacific, domestic, Caribbean and South American operations. The Army controls all priorities of the domestic civil airlines as well as those of Pan American in the Caribbean and South America. All other operations of Pan American and the entire transatlantic service of American Export lines are under Naval priority.

The Navy and the Army's Air Transport Command co-ordinate priorities, depending on which service can be most advantageously used to a particular destination, and work hand-in-glove in every way possible.

(*Continued on page* 114)

Martin Mariner flown by Naval Air Transport Service unloads at Miami after flight from the Panama Canal Zone. Designed as a patrol bomber, the Mariner has also been used for transport purposes. Rear turrets are not on standard transports.



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NATS IN THE ALEUTIANS

POWER

BOMBER AND CARGO

B-36

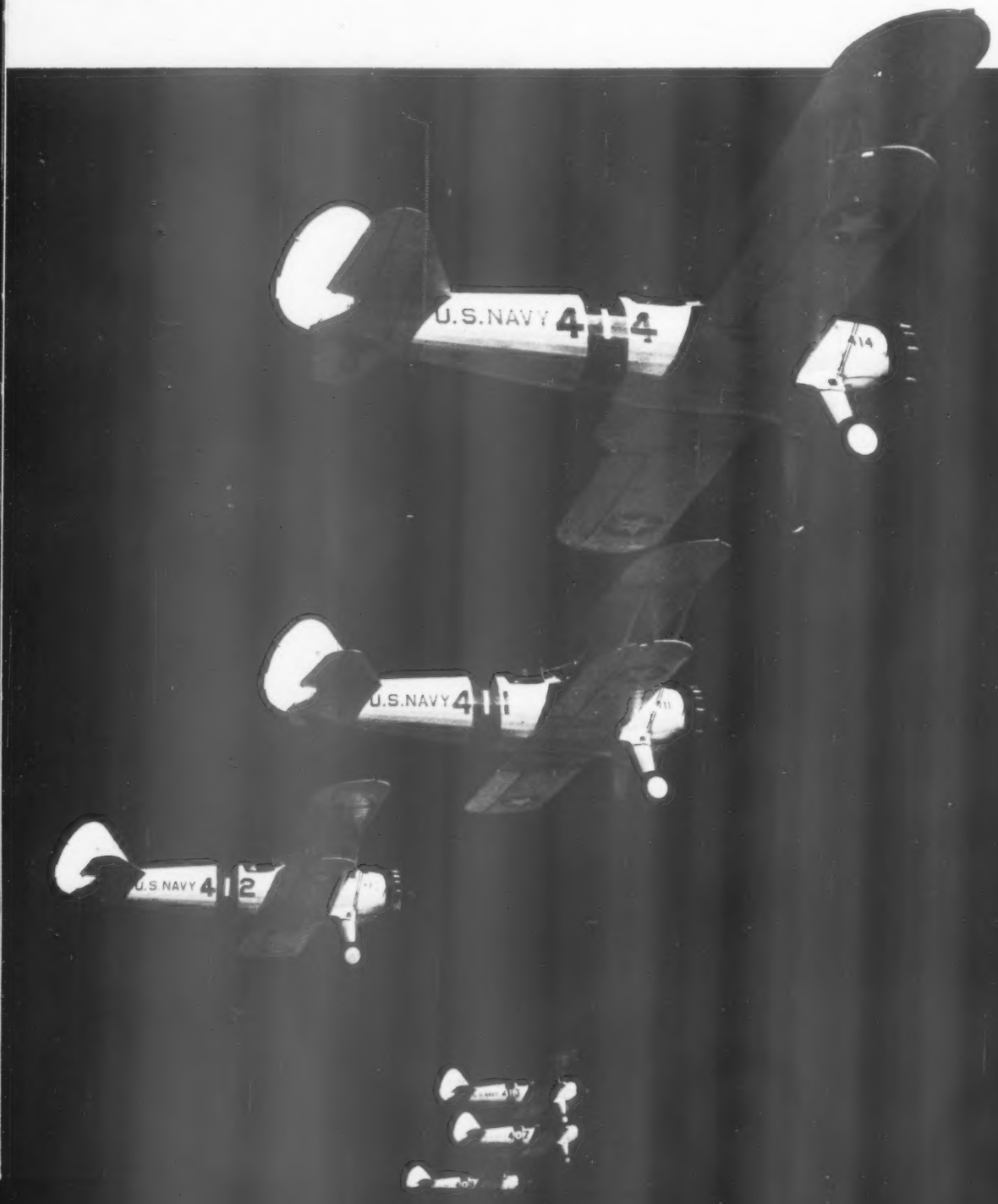
IDLE HELLDIVERS

TRAINING
U.S.NAVY
U.S.NAVY
U.S.NAVY
U.S.NAVY
U.S.NAVY
U.S.NAVY
U.S.NAVY

WORKING

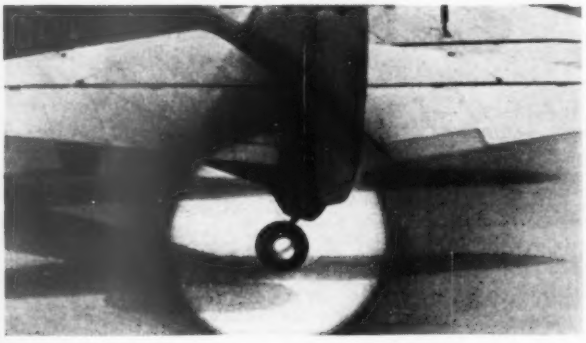
PILOTS, MEET THE CAYDET

Most widely-used biplane primary trainer in the world, the Boeing (formerly Stearman) Caydet is standard in the AAF as the PT-13 and PT-17, and in the Navy as the NS and N2S. The photographs on the following pages are based on the official Navy familiarization strip film on the Caydet.



1 Powered with an air-cooled Lycoming engine of 220 h.p. (at 2,100 r.p.m.), the Caydet has two cockpits. Span is 32 ft. 2 in.

2 Gross weight is 2,650 pounds, wing loading nine pounds per sq. ft. The fixed landing gear is equipped with hydraulic brakes.

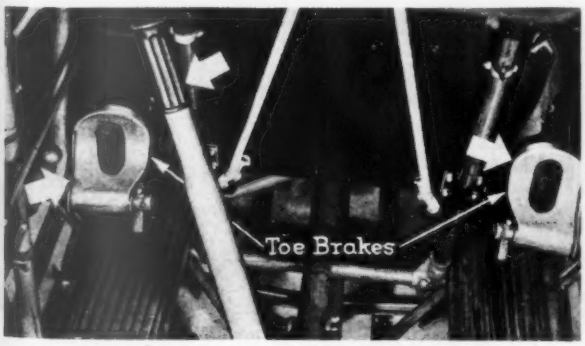


3 Tail wheel is full-swiveling, throwout-latch type, with a standard eight-inch streamline tire, excellent for maneuvering on ground

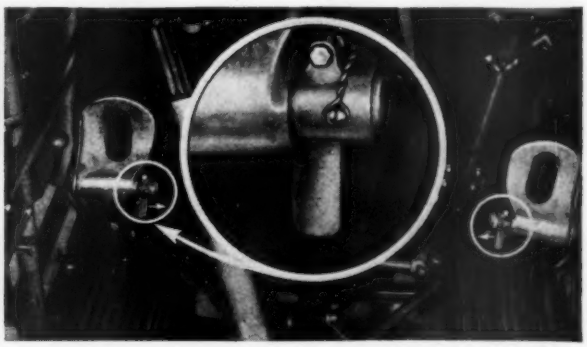
4 Fuel is carried in 46-gallon tank in the center section of upper wing. Oil (4.4 gallons) tank-neck is on left side of engine cowl.

5 Student flies from rear cockpit. If plane must be flown from front cockpit only, strap 125 pounds of ballast securely in rear cockpit.

6 Pilot's seat is adjusted by lever (arrow). Spring raises seat when not supporting body weight. Be sure seat is locked before taxiing.

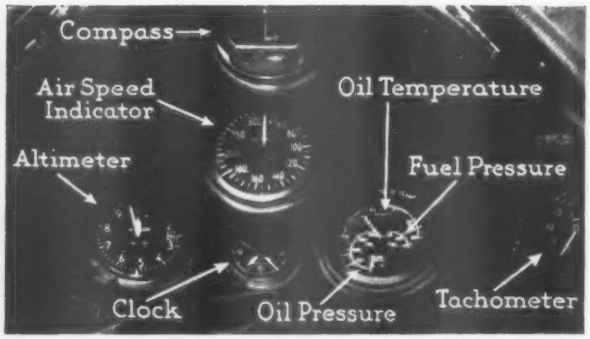


7 The dual controls are the stick-and-pedal type. Pedals incorporate toe brakes (arrows) and rudder, are adjustable fore and aft.



8 Adjust the brake pedals by pulling inboard on each plunger, then release the plunger to lock them securely in place.

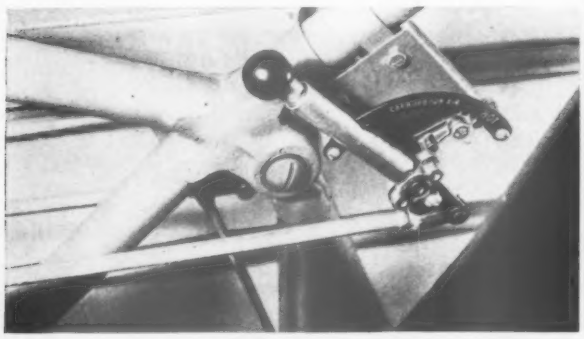
9 The stick controls the ailerons and elevators. It can be locked in neutral by pushing down on the handle at the left of cockpit.



10 The fundamental flight instruments are on the instrument panel. This model of the Caydet is the current Navy version, the N2S-4.

13 Have the mechanic check the oil. Then turn on fuel selector valve (shown above) and call "switch off, gas on" to the mechanic.

14 Have the mechanic pull the propeller through 2½ or three times to clear out oil that seeped past piston rings into the cylinders.



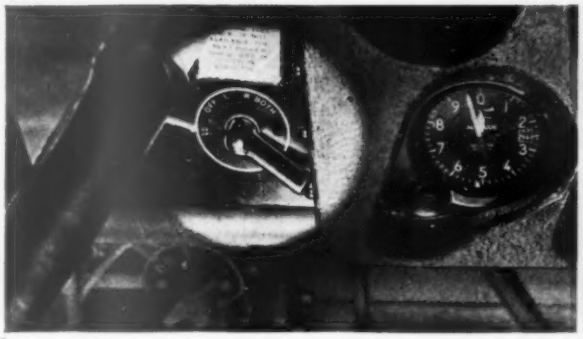
17 Set carburetor air-heat control on "cold." It is on right of fuselage, halfway between cockpits, and either pilot can operate it.

18 Have the mechanic prime the engine. Maximum of five strokes is sufficient, depending on heat of the engine, and the weather.

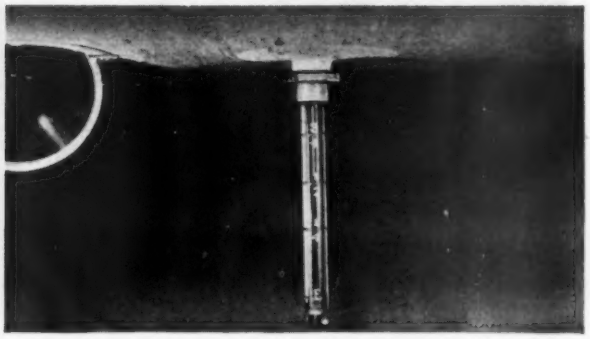
21 Once the inertia starter has been cranked to proper speed, the mechanic engages the starter by pulling and holding this handle.

NOTE — Prime the engine only one or two strokes on the second attempt. If it doesn't start after the second trial, have the mechanic locate the trouble.

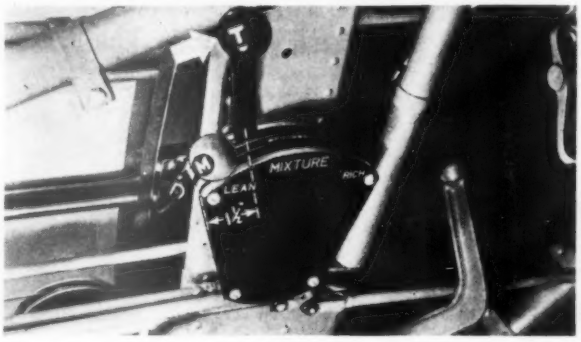
22 If the engine doesn't start on the first attempt, follow the instructions above. Be particularly thorough during winter weather.



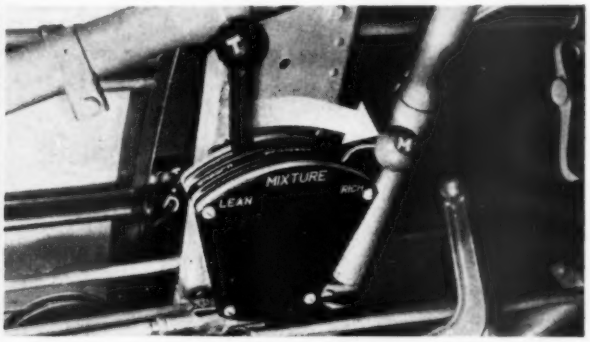
11 Starting the engine is a two-man job, requiring pilot and mechanic. Ignition switch (at left on instrument panel) must be off.



12 Be sure fuel gauge shows full. It is centered in underside of upper wing. Take care that gauge is not stuck in full position.



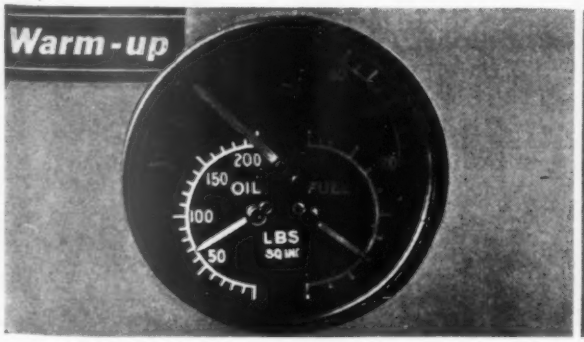
15 Set the throttle at 700 to 800 r.p.m., approximately 1½ inches forward. The throttle control is black, mixture control is red.



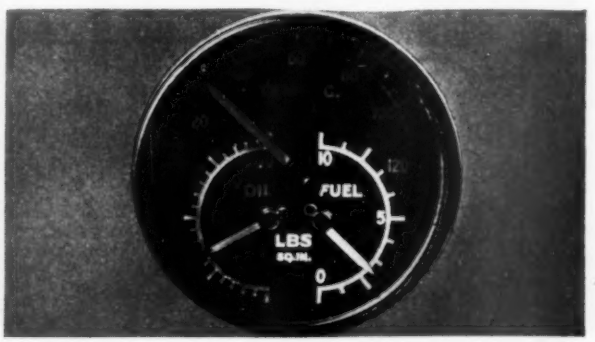
16 Push the mixture control (red handle) all the way forward to full rich. Leave it in that position all the time plane is in the air.

19 After priming the engine, have the mechanic energize the inertia starter with the hand crank. The crank is stowed in rear cockpit.

20 When the starter has been energized and mechanic has given all clear signal, turn ignition switch to "both" and call "contact."



23 Oil pressure should reach 50 to 80 pounds per square inch within 30 seconds. If it doesn't, cut engine and have mechanic inspect.



24 During warm-up, fuel pressure should remain between 2½ and three pounds per square inch. This gauge gives three readings.

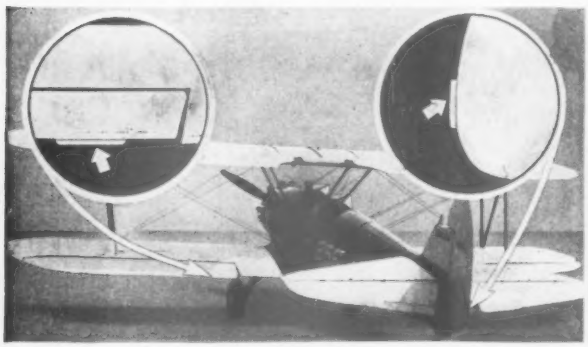
Oil Temperature Chart

Oil Weight	Emergency Minimum for Take-off	Normal Minimum for Take-off	Desired Operating Temperature
1080	10°C.	14°C.	47° - 85°C
1100	15°	20°	54° - 95°
1120	20°	25°	60° -102°

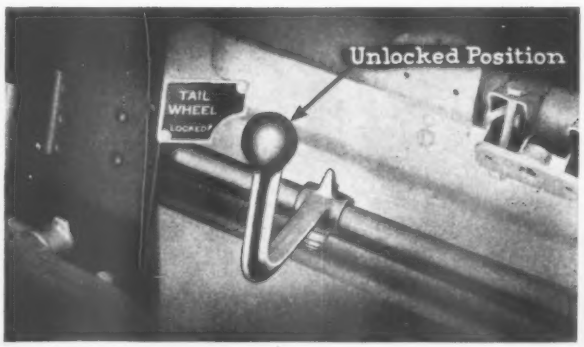
Never take off below these temperatures.

25 If air temperature is below 50°F, warm engine 15 min. despite oil temperature. Chart shows temperatures for three oil weights.

26 Set throttle to 1,400 r.p.m., then test magneto switch from right to left. Drop on each magneto should not exceed 50 r.p.m.

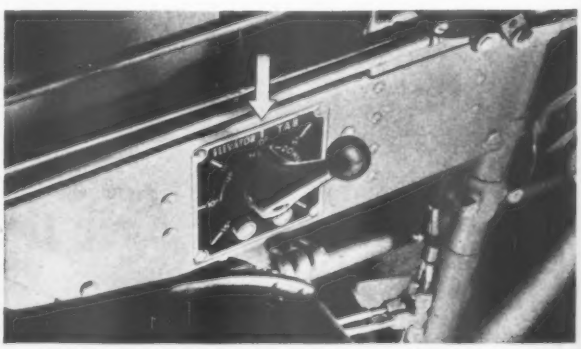


29 Aileron and rudder have metal tabs that are adjustable on ground. Only trimming tab adjustable from cockpit is on elevator.

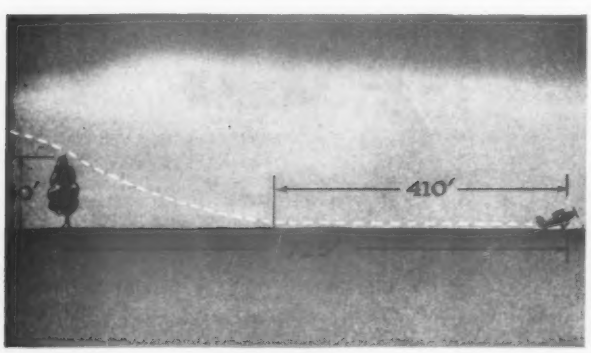


30 Unlock the tail wheel before taxiing. Handle is on right side of cockpit. When ready to take off be sure tail wheel is re-locked.

33 When clear of obstacles, ease back on the throttle to about the ¾-forward position. This will produce approximately 1,800 r.p.m.



34 After levelling off, adjust the elevator trim tabs for hands-off flight. Maximum trim is 15° in nose-up or nose-down condition.

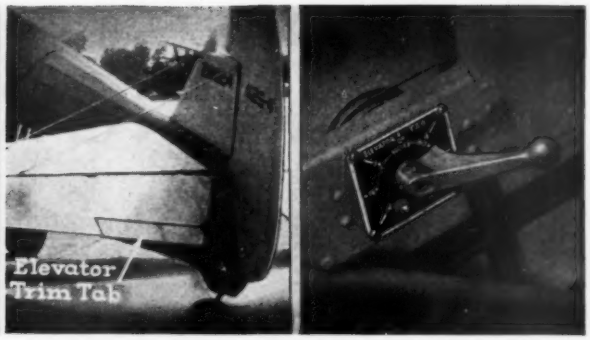


37 Diagram shows sea-level landing distance needed to clear 50-ft. obstacle with no wind and full load. Landing speed is 53 m.p.h.

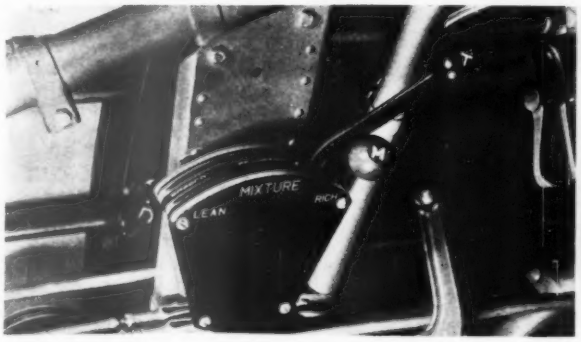
38 After landing, unlock tail wheel, taxi into place and let engine idle. When it has idled enough to cool, throttle up to 800 r.p.m.

FLIGHT CHECK-OFF LIST	
Take-Off	Landing
Set Elevator Tab	Set Elevator Tab
Set Mixture Rich	Set Mixture Rich
Fuel Cock On	Fuel Cock On
Lock Tail Wheel	Lock Tail Wheel
Taxi Unlock Tail Wheel	

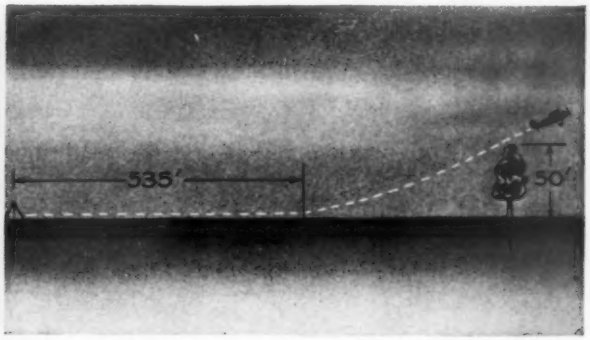
27 This check-off list is mounted on the instrument panel. It is important to safety and efficiency that this list always be used.



28 The elevator trim tab is operated by control on left side of the cockpit. Important: for take-off, set tab in nose-down position.



31 Unlike high-powered combat planes, take-offs in the Caydet must always be made with full throttle. Mixture control is full rich.

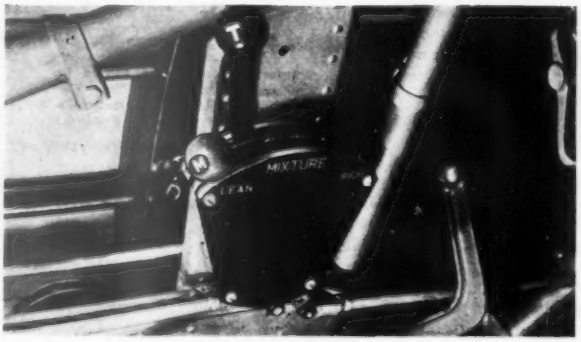


32 Take-off distance necessary to clear 50-foot obstacle is shown in this diagram. This is at sea level and plane has a full load.

Indicated Air Speed	91 Knots
R. P. M. of Engine	1785
Oil Pressure	50 to 80
Oil Temperature	30 to 65 Degrees C.
Fuel Pressure	3 Pounds

35 These are typical instrument readings for good flight operation. The Caydet's range is 347 miles cruising at 91 knots (105m.p.h.).

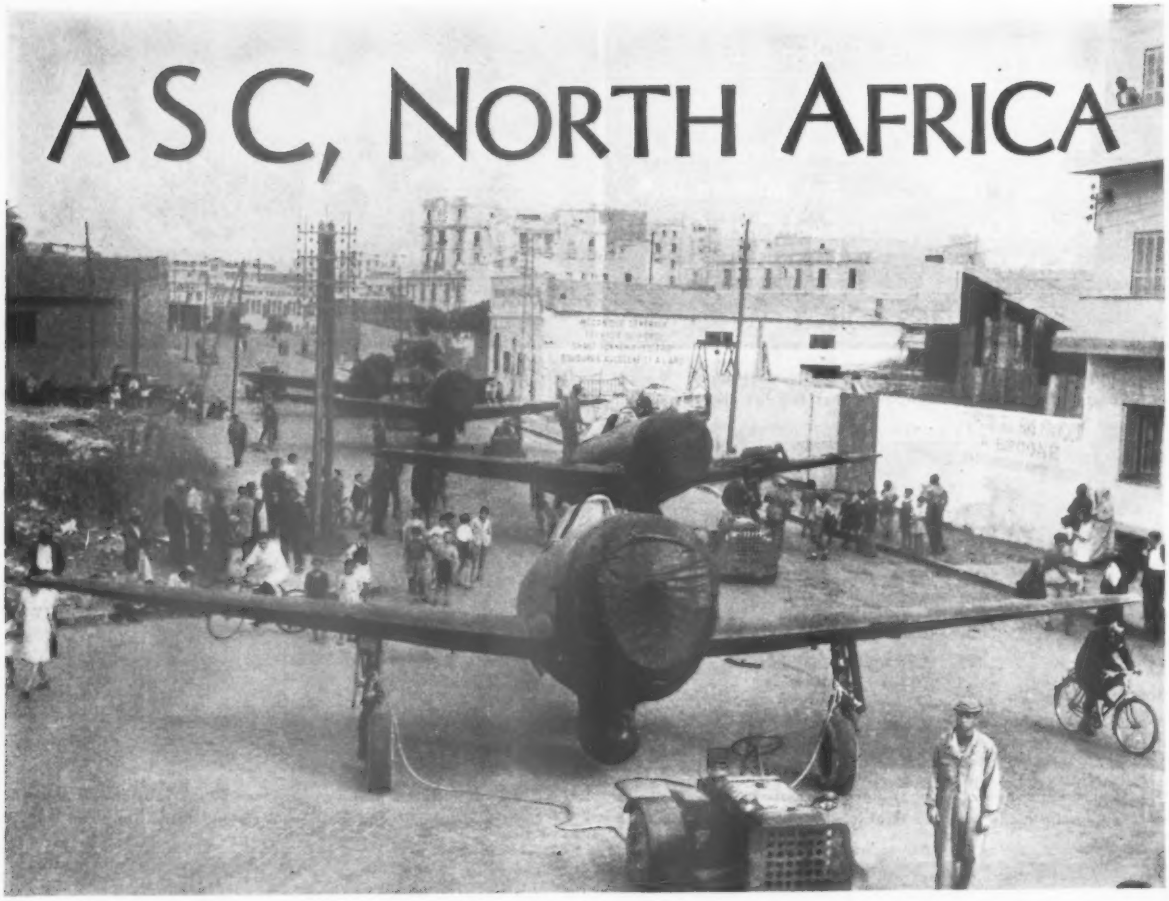
36 When in position for the landing approach, cut the throttle and enter the glide, setting the elevator tabs in nose-up position.



39 Pull the mixture control back to full lean. When the engine begins to cut out, move throttle forward slowly to ⅔ or full open.

40 When the engine has stopped, turn off the ignition (upper left) and gas valve (upper right). Chock wheels and lock the controls.

ASC, NORTH AFRICA



Republic Thunderbolts, arriving at North African port, are moved through streets for final checkup by ASC men

By Col. ROLAND BIRNN

The Air Service Command supplied the fighting planes with munitions, bombs, gasoline, parts and repairs.

SOMEWHERE IN ITALY.

THE group and squadron airdromes were spotted for hundreds of miles along the top of Northwest Africa. They were somewhat self-contained—towns as well as airfields. Their residents maintained their machines, the planes. Up to a certain point they made their own repairs They policed their part of the towns in both a military and civilian sense.

The head of any airfield, the commanding officer, was also the operational head of the town. Like a mayor, he maintained law and order. As head of the airfield he saw that the production gang, the combat crews, did their missions.

The organization which performed all this was part of the Northwest African Air Forces Service Command. When NAAF became Mediterranean Allied Air Forces on January 1, 1944, the service command became known as Army Air Force Service Command, Mediterranean Theater of Operations (ASC/MTO).

It was a combat theater organization. If we stick to the terms of our opening paragraphs, it was the outfit which went to the big supply houses in the U. S., got what the airfield plants and their townspeople needed, distributed them to these fields or to warehouses nearby, maintained heavy-duty shops in central locations and ran depot shops to keep the machines repaired.

The first commander of ASC in the theater was Maj. Gen. Delmar H. Dunton, a World War I pilot. In early post-war days he was the first line big plane pilot for the infant Army Air Service. And he handled his job as well as he had handled the Capronis, Handley-Pages and Martin NBS-1 bombers years before.

When he returned to the States he was succeeded by Brig. Gen. Harold A. Bartron, who as a colonel had been one of his subordinate area commanders and who, like Major General Dunton, was an ex-World War I pilot.

Engineer, World War I flight instructor, Colonel Birnn helped to sink the ex-Ostfriesland off Virginia Capes in 1921, is a long-time pilot and contributor to FLYING.

When the service lads tumbled ashore in Northwest Africa at ports or on the beaches in Morocco or Algiers, their initial supplies came with them. Not all these supplies got ashore safely. Some went to the bottom, some were destroyed on the beaches. Many service officers and soldiers met the same fate. Those were tough days. There was little time for paper work. "Keep the supplies moving"

was the motto and everyone pitched in. Many officers and men of ASC now are wearing the ribbon of the Silver Star for gallantry in bringing gasoline to airdromes through gunfire or for similar acts of service.

The initial beachhead gained, there came the problem of getting the needed supplies and equipment. Depots were established, operated by air depot groups. The supply squadrons took in, classified, stored and issued air supplies. Bulky crates, boxes with engines, fuselage sections, wings and airfoil sections had to be hauled from docks to depots, stored, unpacked, recorded and issued. Special attention had to be given to delicate items such as instruments, or photographic supplies. Typewriters and tabulating machines worked overtime. The Air Service Command in the States had to be told what was needed in Africa and where the supplies should go. This could not be guess work.

The probable rate of consumption of different classes of supplies and types of equipment had to be redetermined. They had already been figured according to theoretical rates (which is all that can ever be done in *advance* of a war or a campaign). Also to be determined were the probable locations of depots, sub-depots and using units, so that the shippers in the States could route material to the most convenient port at the time of arrival. This meant estimating the progress of the war and the probable time of arrival of supplies in the theater.

From the start the depot repair squadrons pitched in and literally set up shop, sometimes in shops already equipped, sometimes in hangars, and even in tents. To these squadrons came airplanes needing third and fourth echelon work, which includes major repair and rebuilding of aircraft, engines and certain accessories. Assembling ocean-shipped aircraft was another job, a major one.

Other air force service units completed the supply and repair picture at the air depots. Among them were signal companies, quartermaster companies, medical supply platoons, ordnance medium maintenance (vehicle maintenance) companies, and military police. Royal Air Force chaps were seen in increasing numbers at the depots; they manned the RAF maintenance units which took care of the RAF needs.

Just as the inclusion of the RAF with the 12th Air Force made up NAAF, so the RAF service units teamed up with the 12th Air Force Service Command to make up the Northwest African Air Force Service Command. Heading up the RAF echelon at NAAFSC Headquarters was Air Commodore Ridley.

The work of ASC did not stop with initial operations. Jerry got himself pushed back and back. Sometimes he kicked out at us and we dropped back. But as our hold on Africa gradually expanded, so did the Air Service Command. Decentralization was necessary. The occupied territory and service facilities were split into three areas, called respectively the I, II and III Air Service Area Command.

Each of these commanders had under him an Air Force general depot, perhaps

ASC mechanics repair wing section of American-operated Spitfire. Service squadrons of ASC take over where combat ground crews stop in third and fourth echelon repairs, in which are classified aircraft requiring major repair work or complete rebuilding.

In Africa, repairs had to be made under the most primitive conditions. This mechanic is about to replace a bullet-shattered plastic panel in a Lightning's cockpit hatch.

ASC unit lifts fuselage of captured Italian fighter which will go to U. S. for analysis.

some smaller similar establishments, and an Air Force ordnance depot. One of the grave responsibilities of the area commander was establishing and maintaining stocks of bombs, ammunition and gasoline at or near the airdromes in his area. Whatever happened, there must never be a mission cancelled or delayed by a lack of bombs or gas.

A number of service centers were also under each area commander. The service center's nucleus is the headquarters and headquarters squadron of the service group. Various sections: quartermaster, ordnance, engineering, etc., were found in such headquarters. In the field, the operating units were the service squadrons, but generally close to the service center were units such as the following: quartermaster truck company (aviation), quartermaster company, service group (aviation); signal company, service group; ordnance company, medium maintenance (aviation); finance detachment, service group; medical dispensary, and chemical warfare detachment, service group.

The service center commander controlled bomb and gas dumps and supply of these valuable items to the using units, and such necessary activities as the supply of food rations and clothing to the air troops. Just as the service squadron commander tied in closely with the combat group commander, so did the service group commander team up with the brigadier general commanding the wing which headed up the several combat groups.

As an example of Air Service Command versatility, several isolated service centers were so far from the great base bakeries that the bread was stale when it reached them. They organized their own bakeries. One of these isolated centers in a farming community organized an egg-buying market. Six of the nearby Arab towns had their own souk (market) days on as many days of the week. Each day would see an air service truck or two at the souk gate waiting to buy the eggs brought in by the half-dozen by thousands of Moulays or Hamids, and paid for by a watchful quartermaster after having been tested and counted by trusted native experts.

Most important of the supply functions of these field units of the Air Service Command was that of technical supply; seeing that a flow of airplane and engine parts and other technical items needed to maintain and repair the airplanes and gliders was kept going from the depots to the units. A certain level of supply also had to be maintained at each service squadron in case of emergency needs.

The previously-mentioned auxiliary units at or near the service center took care of such activities as running truck convoys, repairing vehicles, maintaining radio or wire communications, handling rations, bombs, ammunition and even the pay of the troops.

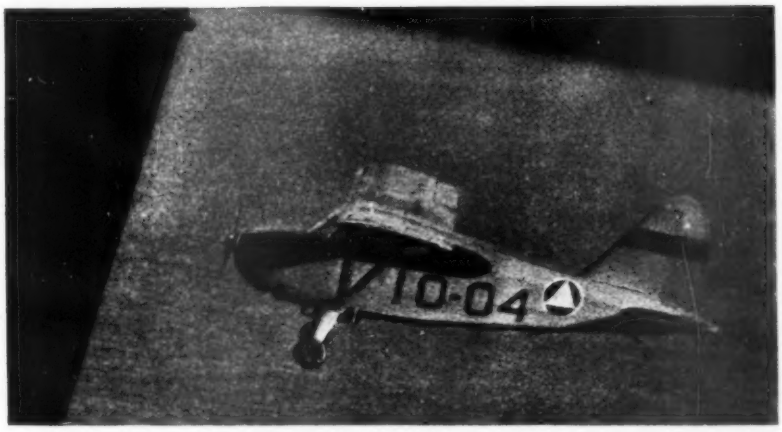
The airdromes of the several groups of the wing for whose benefit the service center operated would be spread for some miles around the service center. Gener-

(*Continued on page* 140)

COASTAL COPS

By
WILLARD
WIENER

Before its hunt was over the CAP spotted 173 subs, found 363 ship survivors.



Stinson Voyager on CAP sub patrol. Twenty-six CAP members lost lives in this work.

AS part of the broad policy of withdrawing all Army participation from anti-submarine activities, the coastal patrol of the Civil Air Patrol passed into history several months ago, thus setting up another milestone in the history of American aviation. Planes and flying personnel of the CAP, withdrawn from coastal patrol duties (now performed by the Navy) have since been assigned to equally important jobs throughout the country to relieve Army airmen and equipment for combat.

The CAP, emerging from a pre-war group of aviation enthusiasts animated by patriotism and an eagerness to do its part in the war effort, now, as an auxiliary of the Army Air Forces, is an integral and vital part of the nation's growing wartime (and probably peacetime) aviation program.

The CAP's usefulness, moreover, has upset some official thinking which, in the early stages of the war, felt that civilian flyers should be grounded for the duration. Some military authorities doubted that civilian flyers could render any real service. These doubts have been dissipated.

With the termination of the coastal patrol, probably its most spectacular activity, the CAP received generous recognition from Naval officials.

Adm. E. J. King, commander-in-chief of the U. S. Fleet, referring to the CAP's volunteers on coastal patrol, said in a letter to Gen. George C. Marshall, Army chief of staff:

"I request that you express to them a 'well done' for their enthusiastic, loyal and constant co-operation in combatting the submarine menace, patrolling our coastline and assisting the locating of survivors and ships in distress."

Vice-Adm. Adolphus Andrews, commander of the Eastern Sea Frontier, said:

"Your unit has rendered invaluable services to this command in fulfillment of its war mission of protecting shipping and combatting the submarine menace. In the performance of these tasks there has been displayed a skill, energy, resourcefulness and disregard for danger which are in the highest tradition of the American armed forces."

The CAP has done (and is doing) an efficient job with a minimum amount of clamor or expense. Although under Army control, the organization has retained its original identity as a volunteer group. Its current activities are numerous and varied.

On the initiative of America's private flyers the CAP came into being just one week before Pearl Harbor. At that time there were 25,000 privately-owned planes in the U. S. A., compared to about 350 planes on the domestic airlines. There were 100,000 civilian pilots, to say nothing of the student pilots, and there were more than 2,000 civilian fields. Volunteer squadrons began to organize in all sections of the country. Members contributed their time, planes, equipment and money.

Packs of U-boats menaced the Atlantic coast. Submarines 245 feet long and mounting four 1-inch guns were sinking American ships at the rate of one per day.

There were no coastal convoys to combat that menace. The Navy was "spread thin" in the Pacific and guarding deep-water Atlantic shipping. Indeed, the Eastern Sea Frontier (1,200 miles from Halifax to the Florida Keys) was manned by only a handful of subchasers (relics of World War I), five old Eagle boats, three ocean-going yachts, less than a dozen good Coast Guard ships and four blimps.

Those were the days when people stood on the beaches and watched American ships go down. In January, 1942, some 12 vessels were reported lost. By March the total had jumped to 42. The rate of sinkings rose to such a degree that for a period in May, 1942, all shipping was stopped until convoys could be organized.

The creation of a civilian emergency aerial coastal patrol was inevitable. CAP obtained an original grant of $18,000 for a trial base "near the worst ship graveyard on the Atlantic Coast." Early bases were established at Atlantic City, N. J., and Rehobeth, Del. The success of the CAP bases, with CAP pilots spotting U-boats, was immediate. Throughout 1942, new CAP bases were established from Maine to Mexico. Volunteers brought their own planes, radios and repair equipment to these improvised bases. In addition to pilots, there were volunteer mechanics, nurses, radio operators, observers, photographers and doctors. Unit after unit in the CAP organization became, as it were, self-sufficient.

The planes of these "flying Minute Men" were at first unarmed, but the crews of enemy submarines were unaware of that, and sometimes when subs had come to the surface to shell tankers they crash-dived when one of the CAP "pleasure planes" passed overhead.

General Arnold became convinced that the CAP could effectively fight subs on their own, after an incident when two small planes sighted a U-boat that crash-dived immediately. The sub rammed its nose in the mud in shallow water. The unarmed patrolers radioed frantically for Army planes while they circled the spot, but before the bombers arrived the U-boat got away. When General Arnold heard of it, he ordered, "Put bombs on them!" From then on, the patrols were equipped to destroy subs unaided, if necessary.

The statistics alone are impressive. CAP pilots and observers have flown more than 24,000,000 miles over the ocean. They spotted 173 submarines. They dropped bombs or depth charges against 57, and they are officially credited with sinking or damaging at least two U-boats in addition to those sunk by Army and

(*Continued on page* 158)

PACIFIC REPORT

Smith's camera recorded this close call off Rabaul when only the carrier's maneuvering avoided a direct hit from Val dive-bomber.

W. Eugene Smith, FLYING's ace photographer-war correspondent.

An eye-witness account of Naval air combat operations in the Pacific theater.

THERE are some high-ranking U.S. Navy officers now fighting in the Pacific war zones who think the Japs might be beaten before the Germans. This opinion was voiced by W. Eugene Smith, FLYING photographer-war correspondent, who recently returned to this country after spending six months photographing the air-war in the Pacific theater. Most of those six months were spent on one of the hardest-fighting of all the Navy's new, big combat carriers.

"Every time one of our Navy task forces has hit the Japs lately," Smith told FLYING's editors in Chicago, "they have come away surprised at the ease with which our planes, pilots and surface vessels have been able to hit the Japs—and knock them out." Smith said the war in the Pacific now is months ahead of the conservative schedule originally set by

In midst of attack by Jap Vals, Ensign Watts took off and shot down Jap diving on carrier.

Navy commanders. This, Smith says, is due largely to the fact that U.S. Navy experts estimated that the Japs would put up a tougher fight than they have in recent months.

Smith hastened to add that this is not just sheer optimism. He accompanied his carrier's airmen on 12 combat missions against supposedly strongly-defended Jap bases. Each time, he says, the pilots on his carrier and the other carriers in the task force came back from operations like that against Tinian and Truk and expressed surprise at the comparative ease with which they were able to smash up those strongholds.

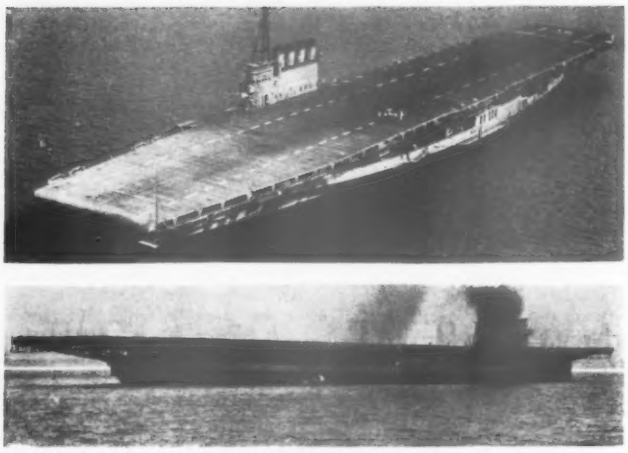
Toughest Jap nut to crack was—and still is—Rabaul, according to Smith. It was the November 11 Naval air attack on Rabaul in which both Smith and the carrier on which he was based got their first taste of combat. Some of the photographs Smith took during that operation (called a "strike" on carriers) appeared in the February, 1944, issue of FLYING. During that attack, the Japs at Rabaul retaliated by sending 125 dive bombers and torpedo bombers to attack the task force, probably planning to catch the carriers without fighter protection; most of the carrier's Grumman *Hellcats* were flying as escort to the Grumman *Avengers* and Curtiss *Helldivers* that were bombing Rabaul. But the U.S. commanders, anticipating such a move, had assigned a squadron of land-based Marine fighters —Vought *Corsairs*—to cover the task force while the *Hellcats* were over Rabaul. The Marines dived to the attack, broke up the formations and, with some of the carriers' returning fighters, chalked up a score of 54 Jap planes shot down that day. According to Smith, that was the Japs' last attempt to sink American aircraft carriers in daylight.

Smith went aboard his carrier November 4, 1943, and left it for the States on March 4. During those four months its planes attacked such Jap bases as Rabaul, Wake, Tarawa, Kwajalein, Eniwetok, Tinian, Guam and Truk. On all these strikes, Smith flew in an *Avenger* with an improvised camera hatch between the pilot's cockpit and the gunner's turret. Many of his pictures have appeared in recent issues of FLYING—12 pages in the May issue—and they include some of the best air-war pictures yet taken in the Pacific. The Navy "pooled" many of Smith's outstanding combat pictures, making them available to all newspapers and magazines throughout the world. One of these was the remarkable photograph taken an instant after the plane in which Raymond Clapper was killed hit the water and burned. The *Avenger* in which Clapper was killed was the same *Avenger* in which Smith had been flying regularly; Clapper had asked to fly in that plane for that one flight.

While his plane attacked enemy ship-

(*Continued on page* 130)

Rare shot (now part of the Navy's official record of Truk attack) was Smith's photo of torpedo from his own plane scoring hit on Jap tanker. Note erratic path of torpedo in center and wake of third (right).



The U.S.S. Wolverine (top) and Sable were Great Lakes side-wheeled excursion steamers before being converted. Their decks are 26 feet above water.

In CQTU's insigne, Donald Duck, as landing signal officer, is signalling an approaching pilot that one wing is low.

CQTU

The Carrier Qualification Training Unit is one of the most unusual organizations in U. S. Naval aviation.

By MAX KARANT

TO BE called a "fresh water" sailor in the U. S. Navy today is not the sneering, corner-of-the-mouth taunt it used to be. Particularly in the Navy's aviation, a large number of officers, from ensigns to captains, have spent an important period in their careers on fresh-water Lake Michigan. As student, instructor, carrier crewman or captain—they have participated in the activities of the Carrier Qualifying Training Unit—CQTU in Navy jargon.

CQTU is one of the busiest, most unusual activities in Naval aviation. Weather permitting, operations are carried on seven days a week, 365 days a year. Saturdays and Sundays are frequently the carriers' busiest days. The only days off that CQTU personnel can depend on are those with the worst weather.

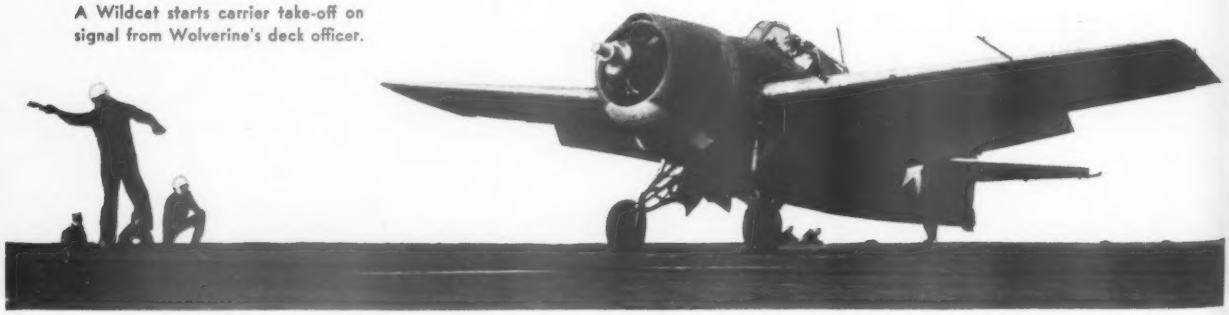
The Navy's single CQTU unit and its planes are based at the Glenview, Ill., Naval Air Station. Its two converted aircraft carriers—the *U.S.S. Wolverine* and *U.S.S. Sable*—drop anchor each night just off the foot of Randolph Street off Chicago's loop, 18 airline miles on a course of 143° from Glenview. During flyable daylight hours, one or both carriers (depending on the number of pilots to be qualified) are often seen by residents of communities on the west shore of Lake Michigan, headed full speed into the wind, landing and launching aircraft.

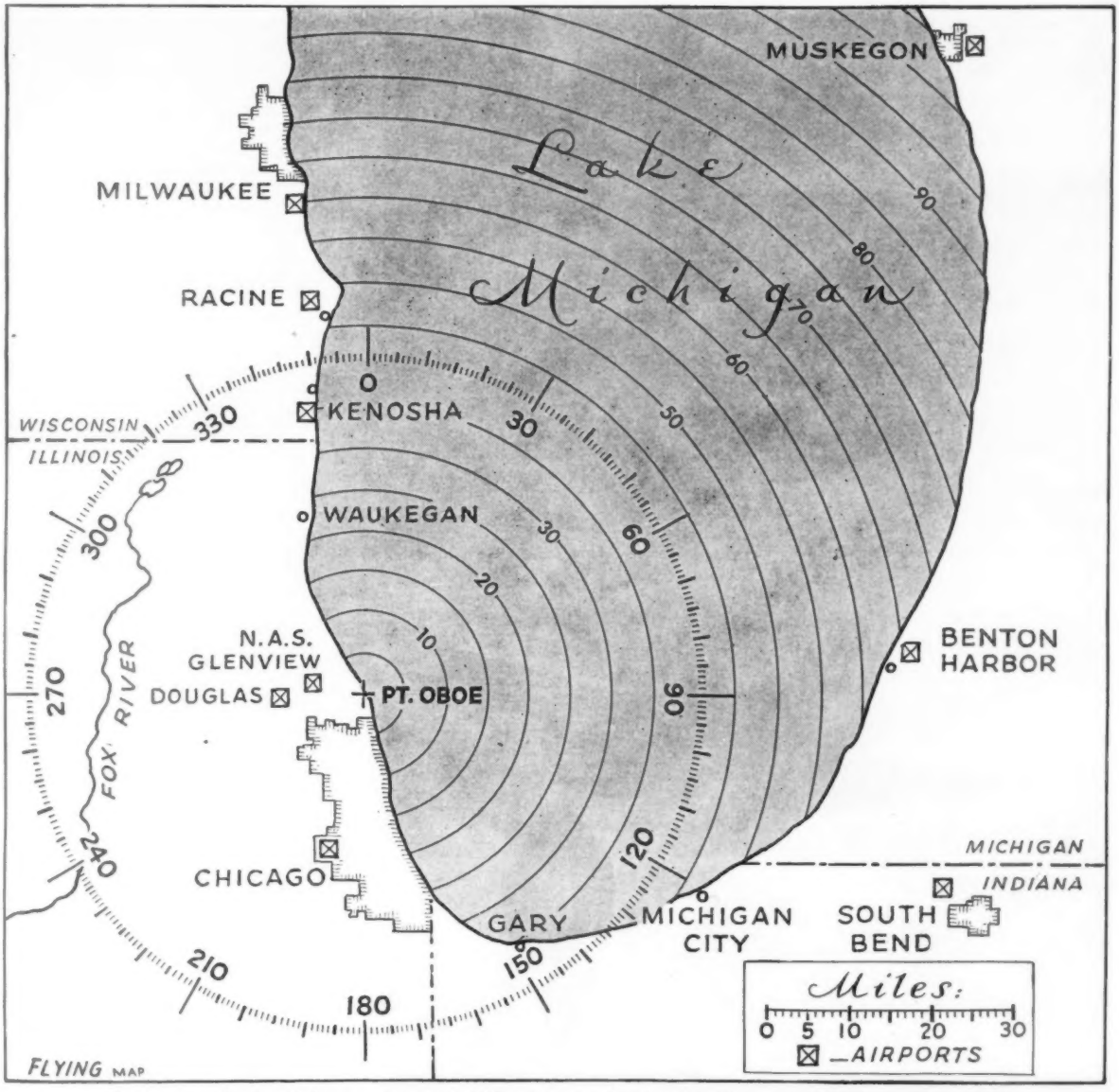
Twenty-two permanently-assigned officers, nine of them Naval aviators, operate CQTU from Glenview. Skipper is Lieut. Comdr. John P. Preston. All officers except three are Fleet veterans. Among them they hold three Navy Crosses, one Silver Star, one Purple Heart, one Air Medal and one Presidential unit citation.

Although based at Glenview, the whole unit is entirely separate from that air station's main activity: primary flight training of Naval aviation cadets. Many primary cadets have learned to fly at Glenview, gone on through many months of advanced training in various parts of the country, then returned to go through CQTU. Except for CQTU's combat planes, most of the planes based at Glenview are Boeing *Caydet* biplane trainers.

The *Wolverine* and *Sable*, of course, are

A Wildcat starts carrier take-off on signal from Wolverine's deck officer.





This is a reproduction of the map given each CQTU student before he takes off for one of the two carriers out in Lake Michigan. The carrier's position is given in degrees and statute miles from Point Oboe, in Wilmette, Ill.

the center of CQTU's operations. The two coal-burners once sailed the Great Lakes as excursion steamers. First sight of them, with their low flight decks (26 feet above water) and wooden-paddled side wheels, probably has given many an old carrier man the shudders. But stares today are only because of their astonishing record in qualifying combat airmen for the Fleet. On March 20, 1944, for instance, the *Sable* alone set a record in qualifying carrier pilots. Each pilot made his required eight landings and take-offs, which meant that the *Sable* handled several hundred landings and take-offs during one day's operations. To date, CQTU has qualified several thousand airmen.

Most Naval aviators slated for duty on a U.S. Navy carrier anywhere in the world today spend an average of three days at Glenview's CQTU. They come from one of the Navy's operational training bases in Florida with 320-350 hours of flying already in their logs. The CQTU student pilot must have completed his primary and advanced flight training, gunnery, tactics, navigation—everything necessary to his becoming a combat Naval aviator. He has had specialized training in the fighter, scout bomber or torpedo bomber he will fly in combat. His three days at CQTU are a kind of last-minute polishing, including his first landings on a real aircraft carrier. From CQTU he goes directly to the Fleet carrier from which he will fight.

Each arriving carrier pilot at CQTU immediately enters into the rigorous training. Before he is sent out to the *Wolverine* or *Sable* he must satisfy his CQTU instructors that he can simulate satisfactory carrier deck landings. This is done on one of Glenview's many outlying satellite airfields, where a rectangle the size of a carrier deck has been marked out. Flying the type of fighter, scout bomber or torpedo bomber he will pilot in the Fleet, the CQTU student must make a series of satisfactory approaches and landings and show that he can follow the signals of the landing signal officer correctly and promptly.

Meanwhile, during his stay at Glenview he must pass exhaustive swimming tests in the station pool. He must, for instance, be able to swim 400 yards with his clothes on. He is taught how to swim safely through burning oil. He must demonstrate that he can inflate and get into his rubber life raft with safety.

Tire, burst during landing on Wolverine, is replaced as Texan stands on carrier outrigger.

Landing signal officer has just given this Avenger the "cut." Note plane's landing hook.

After one or two days of this concentrated training, the young officer is ready for his eight landings and take-offs on the *Wolverine* or *Sable*. His number is posted on the flight board and he waits in the ready room until it is called. As many as five CQTU students then gather around the instructor who will lead that particular flight to the carrier. The instructor gives last-minute pointers and assigns each pilot to a position in the formation. Small maps of the area, such as that accompanying this article, are given each pilot so he can plot the latest position of the carrier.

All navigation to and from the carriers centers on Point Oboe, the code name assigned to famed Bahai Temple, a prominent landmark in Wilmette, Ill., on the shore of Lake Michigan. CQTU (radio code name: "Charley Queen") flights between Glenview and the carriers always pass over Point Oboe; navigational fixes are given from that landmark, not to the air station itself.

The carrier-bound flight frequently is made up of all the Navy's current combat plane types. The flight of five students bound for the carrier may contain a mixture of fighters, scout bombers and torpedo bombers; the instructor usually leads the formation in a hook-equipped North American *Texan* (SNJ-4C). It is not unusual to see a *Texan* leading a formation made up of Grumman *Wildcats*, *Hellcats* and *Avengers* and Douglas *Dauntlesses*.

Whether combat aircraft or *Texan* scout trainers go out depends on the speed of the wind into which the carrier is steaming. Planes with high wing loadings must have winds of higher velocity; the lighter *Texans* can operate on and off the carriers in all but a dead calm. Occasionally, if the wind stays too low to permit the operation of combat types and a large backlog of pilots is waiting to qualify, they will be sent out in the scout trainers.

When the carrier radios she is ready, the flight takes off and joins up on the instructor as they head for Point Oboe, seven miles from Glenview air station on a course of 102°. Over Point Oboe, the leader guides the flight out over Lake Michigan on a course radioed by the carrier. Within a few moments the carrier is

(*Continued on page* 138)

When weather holds up actual carrier operations, simulated carrier landings are made on field. This Wildcat is making good approach.

Chief Petty Officer teaches radio direction finder operation at Madison, Wis. WAVES replace men in the operation of such equipment.

Capt. Mildred H. McAfee

The AIR WAVES

By JAY ALLISON

Needing experienced help, Navy now promises definite commissions to qualified applicants.

THE demand has increased so greatly for women with technical ability, particularly in the various branches of aviation, that the Navy has issued new regulations under which officer applicants for the Women's Naval Reserve may be promised commissions of a definite rank.

Before the end of this year, Capt. Mildred H. McAfee, head of the WAVES, hopes to enlist about 5,000 more officers, from ensigns to commanders, to complete the set quota of 11,900.

Especially needed are women who have had experience and training in some branch of aviation, particularly radio electronics, aerology and air navigation. Women with administrative ability also are needed in this type of work.

As the tempo and scope of the sea-air war against the Japanese increases during the coming months, such skilled women will be needed in greater and greater numbers to replace male officers who are expected to be detached for combat duty.

Adm. Ernest J. King, commander-in-chief of the U. S. Fleet and chief of Naval operations, foreshadowed mighty new thrusts against the Japs recently when he told newsmen he anticipated "a shift of power from the European theater to the Pacific theater not only when Germany is defeated, but as her defeat seems near at hand."

The change in regulations regarding WAVE officer applications undoubtedly was issued to assure a steady flow of skilled women into highly technical posts.

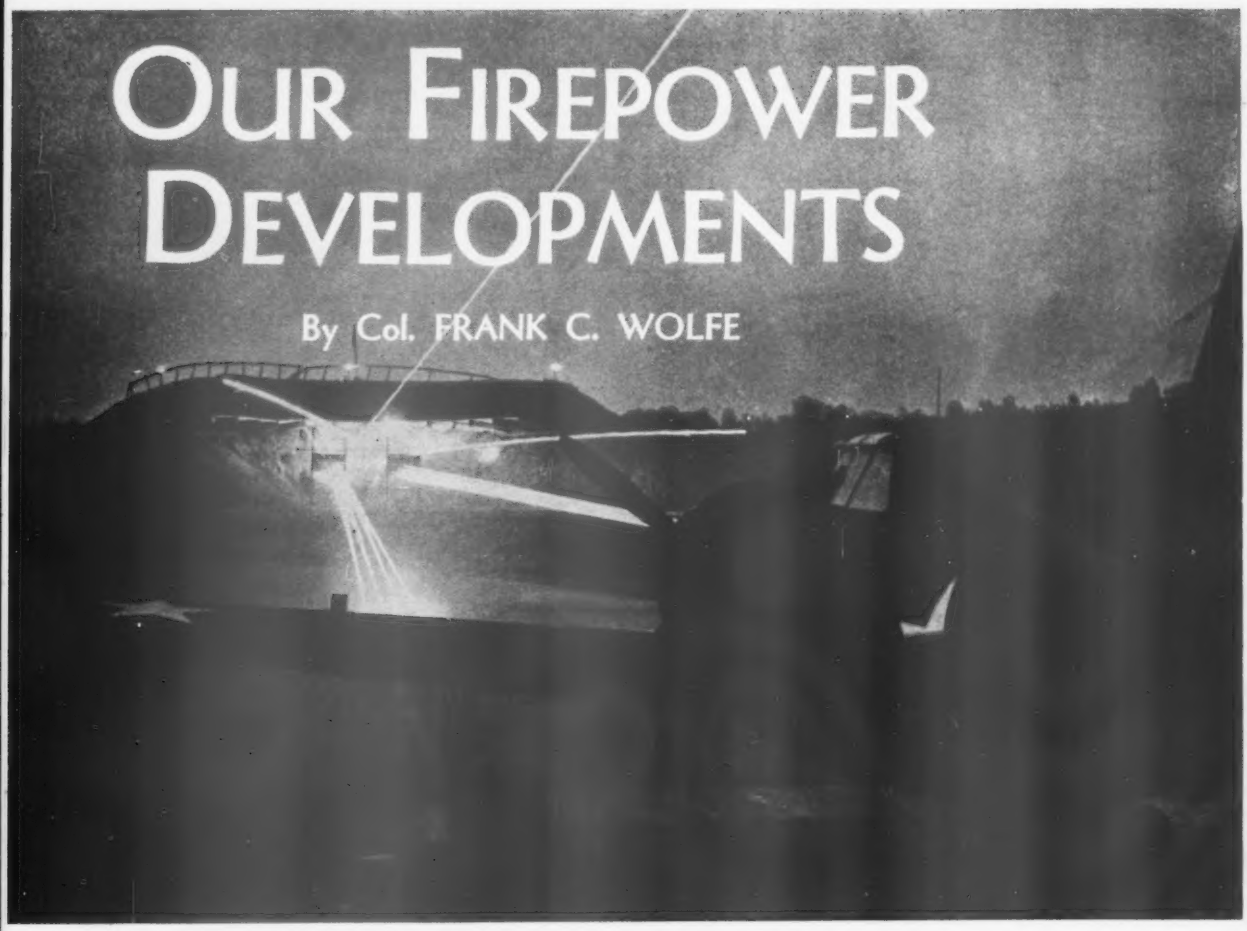
Heretofore all women accepted for officer training were sworn into the Naval Reserve for general service and their rank and assignment was determined while they were in school.

Now the Navy stands ready to make commitments ahead of time to applicants,

(*Continued on page* 150)

OUR FIREPOWER DEVELOPMENTS

By Col. FRANK C. WOLFE



Inadequate firepower of pre-war planes brought forth today's typical Thunderbolt array of eight .50-caliber machine guns.

Modern firepower has transformed the aircraft from a mere plane with guns to a package of guns with wings.

Reprinted from "Air Force", the official AAF service journal.

COMBAT experience has necessitated re-arming our fighting planes. The trend is toward new and increased firepower and our accomplishments are making American fighting planes the world's most formidably-armed aircraft.

Our recent firepower development, as much of it as we can discuss at this time, includes:

Heavier caliber machine guns.

Heavier rapid-fire cannon.

Hydraulic and electrically-operated gun turrets with multiple gun installations.

Remotely controlled and power-boosted and hand-held machine gun mounts.

Remote control and fire control systems.

Increased firepower for nose and tail positions of all types of bombers.

Power-driven nose turrets in heavy bombers.

Interchangeable nose turrets for a light bomber type.

Multiple 37-mm. cannon mounts in bombers for forward fire.

Multiple gun turrets for night fighters.

Forward-firing fixed 20-mm. cannon in a light bomber type.

Fixed gun installation for fighter aircraft to provide automatic corrections for lead, range, altitude and speed.

Improved computing sights for all gun positions.

Emphasis on placement of guns to assure maximum protection.

Fighter gunsights which extend present sighting ranges.

Combination gunsights and dive bombsights.

Personnel flak suits and armored helmets.

Improvements in armor plate and bullet-resistant glass.

Improvements in the gunsight aiming-point camera.

The firepower problem is not new. Aircraft armament dates far back to 1909, at College Park, Md., when the Wright brothers were training our first military aviators—among them today's commanding general of the Army Air Forces, Gen. Henry H. Arnold. There the first machine gun, carried in the lap of a passenger, was fired at a ground target from a flying machine. It was there also that crudely fashioned bombs were taken aloft and dropped on targets.

Subsequent steps in converting the airplane into an effective military weapon were made during the first World War when Germans and Allies introduced new methods of fitting their planes with machine guns and bombs. As early as 1915, German observers over Paris fired rifles at French aircraft in the air. The French retaliated with automatic rifles. Later, machine guns mounted on the wing, shooting over the propeller, and located at various other positions on the airplane, were introduced. Next, guns were synchronized to fire through the propeller. From then on, Germans and Allies increased the firepower of their aircraft. The French used the first cannon, a 37-mm. Hotchkiss, on the Voisin airplane. Guynemer, the French ace, used a similar cannon, firing through the propeller

(*Continued on page* 104)

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DEADLY NOSE ARMAMENT OF THIS LATE-MODIFICATION DOUGLAS A-20 IS FOUR .50 CALIBER GUNS.

THIS WESTLAND LYSANDER CARRIES THE MARKINGS OF AN RCAF TARGET-TOWER.

Shaped for Flight!

HERE two hollow rib-reinforced steel forgings begin to assume the subtle contours of Aeroprop propeller blades. They are being shaped on one of the many machines especially designed to mass-produce a new idea in propeller design—a propeller with hollow, rib-reinforced steel blades—a propeller unit-constructed for easy maintenance—a propeller combining all of the qualities of strength, lightness, and simplicity—a propeller less than three years old, yet famous today on every fighting front—the AEROPROP.

Today, thousands of Aeroprops are in service as thousands more move down production lines to take their places on new swarms of Allied fighters. That this has been accomplished in so short a time is further proof that America's skilled workers and production-wise machinery is an enormously resourceful and productive combination.

Today this combination is shaping Aeroprops for war, and for nothing else. When it's won these men and these machines will continue their leadership in the design and construction of modern propellers. Their job then, as now, will be to shape the progress of the conquest of the skies.

KEEP 'EM FLYING! BUY BONDS!

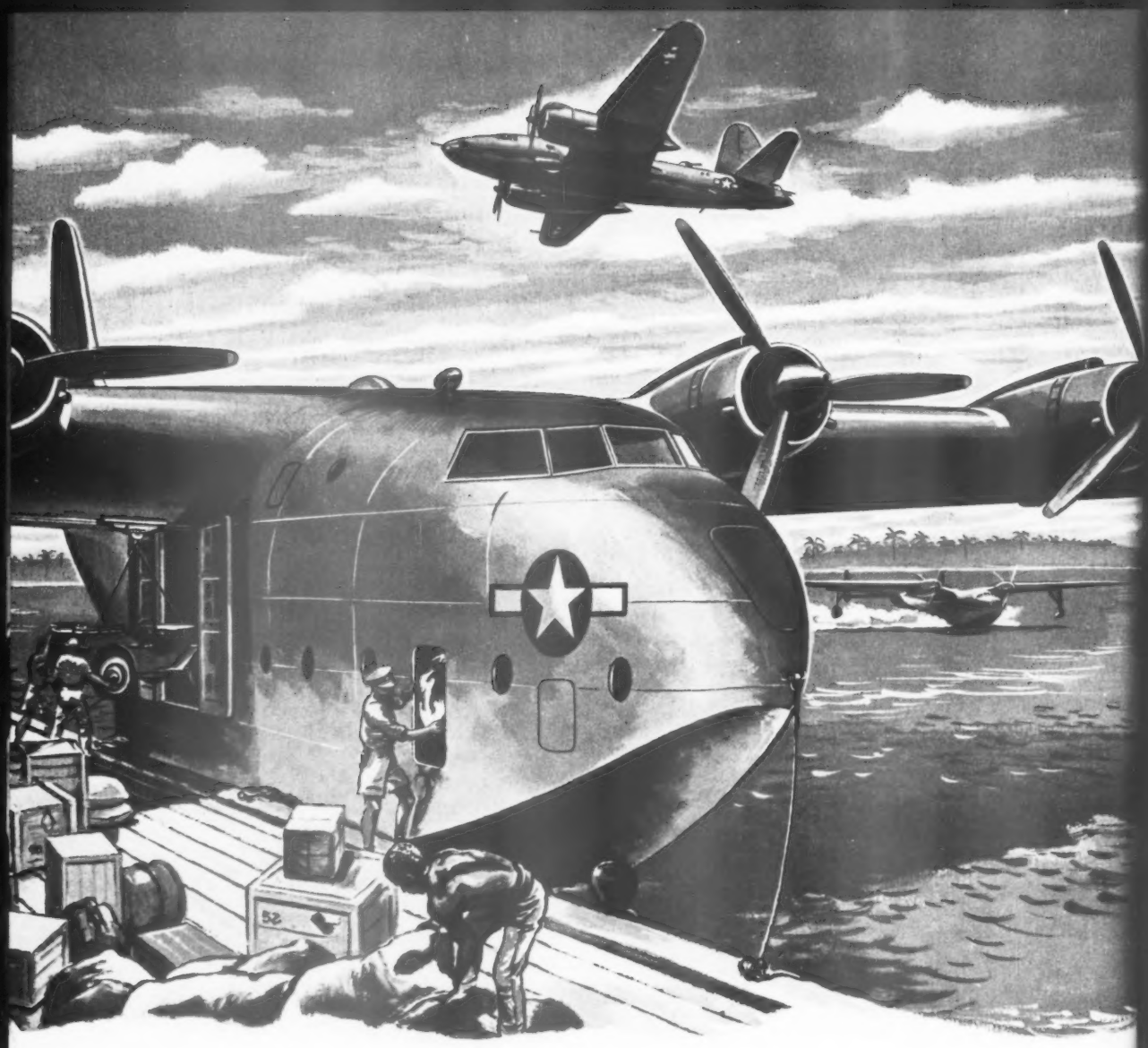
Aeroprop

ARMY-E-NAVY

In War and Peace, Propeller Production at its Best!

AEROPRODUCTS DIVISION • GENERAL MOTORS CORPORATION • DAYTON, OHIO

GM ARMS FOR VICTORY



Greater warloads for the Mars

Two more passengers . . . another drum of 100 Octane . . . or nearly 1400 rounds of cal. 50 ammunition — this is the warload bonus provided by the 411 lb. lighter installation of Curtiss hollow steel blades on the Martin Mars.

This impressive reduction in complete installation weight is achieved notwithstanding the addition of the

automatic propeller synchronizer and reverse thrust for greater surface maneuverability — both exclusive Curtiss features.

CURTISS ELECTRIC PROPELLERS

Curtiss-Wright Corporation, Propeller Division

Illegal Lady

One of our agents saw the *Memphis Belle* before that famous *Fortress* came back from the front. He suggested we pay particular attention to the sketch of a fetching gal in the nude which the crew had drawn on the plane—he said it was "quite something." But when the *Belle* came home, the babe was no longer nude.

We investigated and unearthed sufficient data to permit an interesting report.

Dressed or undressed, the lady is illegal, according to Army regulations. The only authorized drawing on service planes is that of the squadron or group insigne, and she is neither.

Squadron insignia run an official gauntlet which she could not survive. A proposed insigne may be drawn up by the boys in the outfit and submitted to the War Department for approval: or, if no one in the outfit can draw, ideas for a design are sent to Washington and three designs based on the ideas are made up by professional artists. One is a caricature, one dignified, one standard. These go back to the boys and they pick their favorite. Washington then records the favorite as the official insigne of the squadron in question. Squadrons may undergo changes and may be assigned a new number, but henceforth the insigne remains the same.

Each plane in the squadron may sport the insigne, which may also be worn by a squadron member over the left pocket of his leather jacket.

Each group may also have an insigne, created by the same process. All planes assigned to headquarters of the group carry the group insigne. It is specified (Washington being the city of wonderful wackiness) that the designs be put on between the wings and the tail assembly and be not more than 75 per cent of the overall height of the fuselage at the point of application.

Thus the babe on the *Memphis Belle* and other pictures and captions about which you may have heard are strictly unofficial. Indeed, the boys aren't supposed to paint any suggestive or obscene pictures on Army equipment of any type.

Directives have been sent to theater commanders asking that they please *please* clean up the pictures. One story is that an aide to King George of England nearly swallowed his teeth when the King asked the meaning of some words painted on the ball turret of a U. S. bomber. Other brass hats, including Secretary of War Stimson, have been similarly embarrassed in foreign fields.

Each time there is an incident of this sort, another set of directives goes out. Their effect, however, is in reverse to their purpose; theater commanders do nothing on morale grounds and individual artists are only inspired to greater efforts.

Washington has resigned itself to prohibiting individual drawings in this country and to requiring that planes coming back here from the fronts be cleaned up. The babe on the *Memphis Belle* first faced annihilation, but the crew finally saved her by painting on a sweater.

Jet Mystery

Not to bore you with our favorite subject, but here we are again with some more mysteries about the mysterious jet propulsion plane.

Seems that, on the books, the Bell propless masterpiece still is "classified"—mustn't talk much, and then sh-h on the details. But, as we announced last month, at least two sources have edged very close to showing actual pictures of what the Bell fighter looks like.

One of these is a photograph, published by Bell on the front cover of its annual financial report. The picture—undoubtedly submitted to some censorship authority—shows a large area on the fuselage, from the leading edge of the wing back to about two feet behind the trailing edge, cut out and labeled "censored." This actually is a photograph of the Bell fighter; the tail bears the AAF serial number 2108774.

The second published source, an aviation trade magazine, has Army censorship officials fuming. It purports to be an "artist's conception," but is so accurate that Army officials when last heard from were thinking seriously of reading the riot act to the artist whose "dream" was published, as well as with the publication's editor.

One more item turned up here recently. A writer submitted an article to the Army which said, in part, that the jet plane's speed was approximately that of sound. An Army officer crossed out the statement, adding this notation at the bottom of the page:

"Speed is between 500-600 m.p.h., far less than speed of sound."

For the real lowdown, we are eagerly watching our favorite comic strips.

Gremliars

We are not one to favor any more aviation organizations, but on the other hand we itch to incorporate the Loyal Order of Gremliars, whose motto would be, "No Truth, or Anything but the Truth."

For charter membership in the LOG we nominate a British pilot who, because he is on his way back to combat duty over Germany, will remain anonymous. His story is that while on a recent flight over Germany his enthusiasm outlasted his gas and he had to bail out over the Reich. He succeeded in landing and stowing his chute undetected and, being too far from a border to attempt escape, headed for the nearest city to turn himself in.

To his astonishment, nobody challenged him and he finally came to a bus line, got on a bus, and wound up in the heart of the city.

Deciding that he might as well enjoy his freedom as long as it lasted, he picked out a movie, paid his admission and saw a full-length picture. Only when he got out did a policeman in front of the theater grab him. The cop immediately accused the theater ticket-seller, a woman, of negligence. She was indignant.

"Der Fuehrer says anyone in uniform should get in for half price," she protested, "and I only charged the man half price. What're you beefing about?"

At this point in the story we inquired mildly how escape was finally accomplished.

"Easy," said our LOG candidate. "They were so excited they forgot me, so I went to a railroad station and bought a Wagon-Lit ticket to the nearest border, where I went over standing up."

We also nominate 2nd Lieut. Earl J. Bass of Marvel, Ark., stationed with the 472nd Bombardment Squadron. Some time back both engines on the *Mitchell* he was piloting went out simultaneously at 700 feet over the heart of Memphis. With a landing so spectacular that Memphis papers editorialized on it for days, Lieutenant Bass brought her in without injury to anyone on the ground and with only minor injuries to himself and his crew. He has since had to tell the story so often that he now gives the following explanation:

"Everywhere I looked were skyscrapers, so I finally picked out one with a

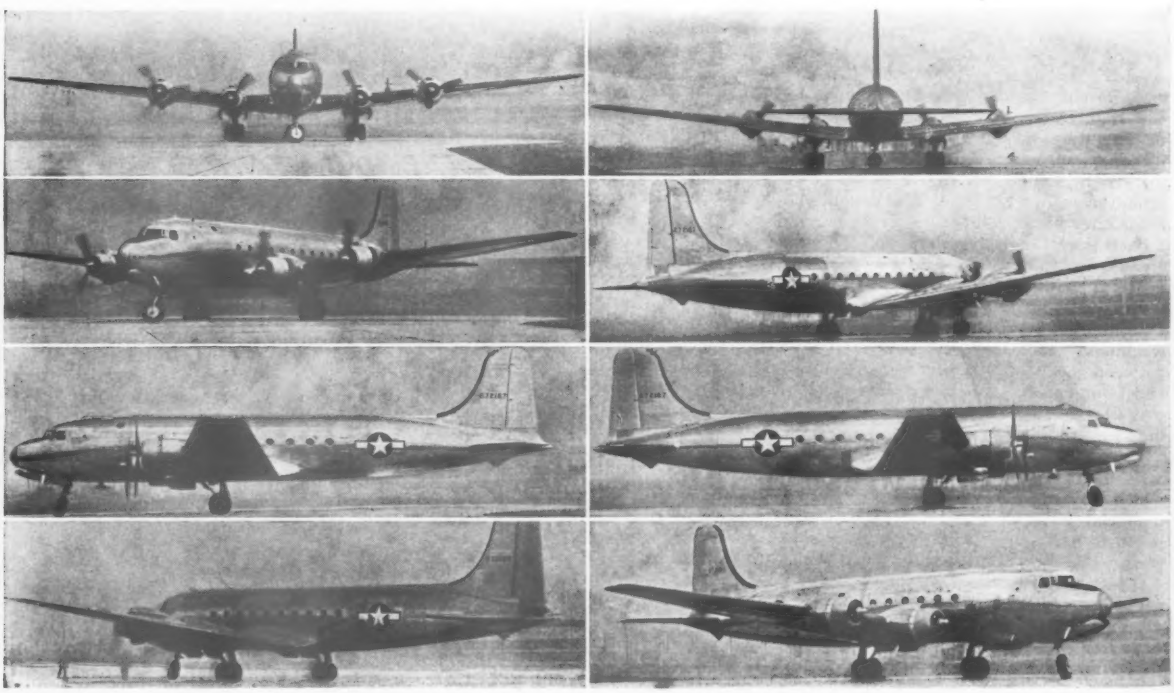
(*Continued on page* 150)

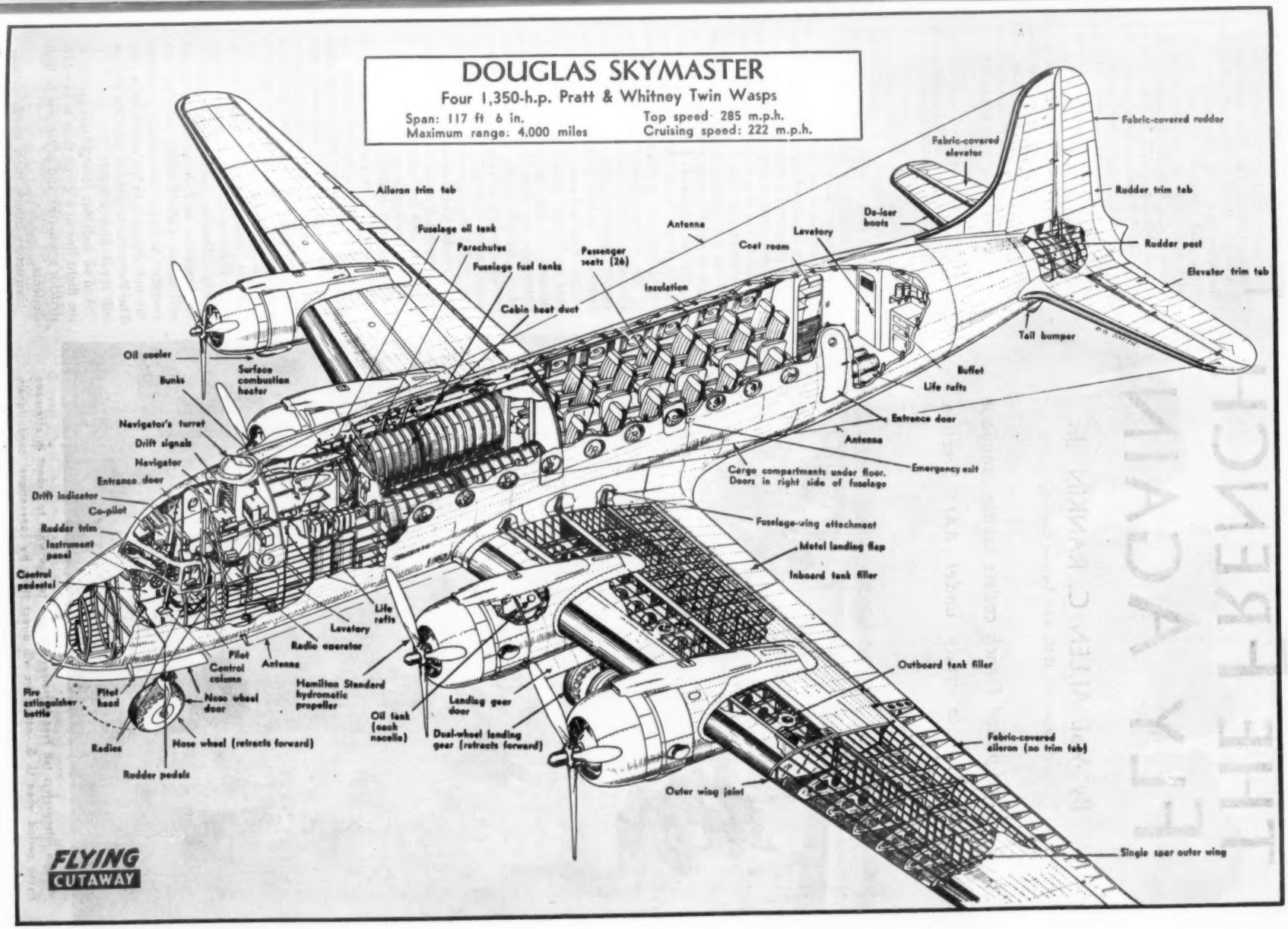
The SKYMASTER

LARGEST four-engined transport currently in production anywhere, the *Skymaster* also is best in its class. The photographs on this page, and the FLYING cutaway opposite, comprise an exclusive pictorial analysis of this transport.

There are two versions, the C-54 for passengers and the C-54A for cargo and paratroops. Only external difference is the large cargo hatch which identifies the C-54A. Both are used by the Navy as the R5D; all versions are officially named *Skymaster*.

Four 1,350 h.p. *Twin Wasps* give the *Skymaster* a top speed of 285 m.p.h. Cruising speed is 222 m.p.h., range over 4,000 miles. Wing span is 117 ft. 6 in., length, 93 ft. 10 in. The C-54A's maximum payload is seven tons, the C-54 normally carries 26 passengers.




DOUGLAS SKYMASTER
Four 1,350-h.p. Pratt & Whitney Twin Wasps
Span: 117 ft 6 in.
Maximum range: 4,000 miles
Top speed 285 m.p.h.
Cruising speed: 222 m.p.h.
Aileron trim tab
Fuselage oil tank
Parachutes
Fuselage fuel tanks
Cabin heat duct
Passenger seats (26)
Insulation
Antenna
Coat room
Lavatory
De-icer boots
Fabric-covered elevator
Fabric-covered rudder
Rudder trim tab
Rudder post
Elevator trim tab
Tail bumper
Buffet
Life rafts
Entrance door
Antenna
Emergency exit
Cargo compartments under floor. Doors in right side of fuselage
Fuselage-wing attachment
Metal landing flap
Inboard tank filler
Outboard tank filler
Fabric-covered aileron (no trim tab)
Single spar outer wing
Outer wing joint
Oil cooler
Bunks
Surface combustion heater
Navigator's turret
Drift signals
Navigator
Entrance door
Drift indicator
Co-pilot
Rudder trim
Instrument panel
Control pedestal
Fire extinguisher bottle
Pitot head
Radios
Rudder pedals
Nose wheel door
Nose wheel (retracts forward)
Pilot
Control column
Radio operator
Antenna
Lavatory
Life rafts
Hamilton Standard hydromatic propeller
Oil tank (each nacelle)
Landing gear door
Dual-wheel landing gear (retracts forward)
FLYING CUTAWAY

THE FRENCH FLY AGAIN

By Maj. ALLEN C. RANKIN, Jr.
Headquarters, EFTC, AAF Training Command

Hand-picked French cadets hurdle language difficulties to study under AAF direction.

Women interpreters tell French trainees in own tongue what to expect in afternoon flying period when U. S. instructors will direct them by conventional hand signals.

THE clapboard barracks at the edge of the green field are the same. The primary trainers run their same rat-race out to the runways, taking off one behind the other as at any other civilian school under AAF contract. But any transient pilot who lands at the 51st Army Air Forces Flying Training Detachment Airport at Tuscaloosa, Ala., will find the familiar old flying school has changed. The French are flying again—and here.

Look and listen for a moment. An American instructor, about to climb in a plane has a final admonition for his student. "Don't tighten up," the instructor says. A woman standing at the plane turns to the student, saying *"Ne vous crispez pas!"* and the dark-faced student nods understandingly and climbs into the cockpit.

The woman stands and watches the take-off. "Not bad," she says, and smiles before turning to another boy waiting his turn to fly. They limp along in rudimentary English for a minute then lapse into French. Other cadets join in and the air gets thicker with the quick, crisp syllables of the French tongue. It all sounds rather strange, but it makes good sense.

The woman is no cadet girl friend, no specially appointed flight line hostess. She is one of several interpreters whose services have been indispensable since the arrival of the first French cadets at the detachment last year.

When the already busy school got the news it would begin the flight training of several hundred Frenchmen handpicked from North Africa, instructors boned furiously in special French classes at the nearby University of Alabama. The university's French teacher, Marguerite Taliaferro, was retained as an interpreter. Gerrie Thielens, Tuscaloosa author, who had been writing about her days at French schools, offered her assistance. It was discovered that a few instructors in both flying and ground school already spoke French. Other French-speaking officers and civilian personnel were obtained. Text books and local flying regulations were translated into French. The girls in the dispatcher's tower quickly learned to translate flightline terms into the language. Thus fortified, the detachment prepared to receive its first French contingent.

But when the new cadets, averaging 22 to 24 years old, dark and strong and burned by the African sun arrived singing French songs, most instructors who had been boning up on their language could only look at each other and shake their heads. The importance of interpreters was at once apparent.

Flight classes—the strangest in the AAF Training Command—began immediately. Despite their quick review in the language, most American instructors still speak little French, certainly not enough to give technical directions through gosports in the middle of a loop. The Frenchmen, though catching on fast, still speak little English.

And so each day interpreters go out on the flight line at a given time to relay instructor's remarks and criticisms to their students.

Instructors intone their words natural-

French-speaking instructor lectures students in own language. Many instructors are learning French.

ly, but much more slowly than when they speak to American cadets. Unconsciously, they begin to shout as though talking to deaf people. Waiting for convenient pauses, the woman interpreters flash out the translation in lightning French.

In this way they try to iron out most of the kinks before the flight. The French cadet gets a good idea of what to expect and what he is to do in the next flight period. He is reminded of his general faults, if any; what he did wrong the day before, and how to improve these things in the approaching flight.

Once in the air, standard hand-signals are used almost entirely, supported only by a few simple English expressions which the Frenchmen learned easily.

The signals are the same as those used in teaching American cadets. A wave of the hand upward on the right means, "Bring your right wing up." Both hands in the air at once means, "Take over, the plane's yours." A pat on the head means, "Let go the controls. I'm taking over."

But on-the-spot advice in the execution of stalls, spins and other aerobatic maneuvers is sketchy at best. The thorough and complete explanation of mistakes made in the sky must wait until the student is back on the ground.

"Relax," is as common advice to the French as it is to the American cadet, and its translated echo is "*detendez-vous.*" In an area crowded with training planes the warning "look all around," becomes "*regardez-bien autour de vous.*"

If a student is particularly weak in certain points, interpreters go into his faults with a verbal fine-toothed comb and try to make him see exactly what is wrong with his flying.

Procedure is similar in ground school where instructors sing out their lessons in long, slow English, while interpreters parrot them in French.

One instructor became totally exasperated with his student, and his student with him. Things had reached an impasse, and the plane was muddling around the sky when the instructor muttered a pet expression—a German expression of disgust. The student smiled brightly, nodded, and began to shout. The instructor, cutting back his motor in order to hear, found the student was shouting in German himself. The two had found a common meeting ground, and they carried on intelligibly in their newfound language. Still another instructor, who had studied Italian in college found he could meet his new student in that language.

Many slang and technical expressions which mean paragraphs in English mean nothing whatsoever in French. For instance, the classic expression "get on the ball," long used to make cadets forget whatever ailed them, has its closest translation in the Parisian idiom, "*maniez-vous les pinceaux*" ("get hold of your paint brush!").

The word "stall" is translated as "*perte de vitesse*" or "loss of speed." Torque is "*couple de renversement.*"

Into no other place on the field have the French thrown more linguistic dynamite than into the small, glass-domed operations tower. Aircraft dispatchers who thought they had a hard time in keeping track of planes checked out in English, now know that the past was child's play.

Gushing up from among the Alabama drawls and Ohio twangs of American cadets, French voices burst into the tower

(*Continued on page* 88)

Ground school instructor emphasizes his remarks with plane model. He talks slowly so interpreter in background, waiting for pauses, may translate lecture into French.

LOCAL AIRLINES

By GEORGE W. BURGESS

Survey of local airline future indicates huge passenger potential in small towns.

THE expansion of local airlines represents one of the most promising fields in aviation. Recent studies by Greyhound Bus Lines show that a remarkably large share of its business comes from small communities. Postal subsidies probably will be necessary at first, as they were with the main lines operating today, and airline operators accustomed to trunk line traffic may have to revise some of their concepts, but present information indicates an important local commercial airline potential. This is a discussion of the prospective markets, operations and equipment of local airlines.

To provide adequate air service for small communities, passenger and mail transportation must be supplied not only from the small to the large community but also between the small communities. This is particularly true in establishing short haul passenger and mail schedules for traffic originating and terminating at these small communities. Such a system contrasts with the present situation where small communities are served only by incidental and other stops that happen to be convenient as refueling points on trunk line schedules.

The importance of relatively short haul small community traffic is indicated by findings of a recent nation-wide survey made for the Greyhound Corporation which draws 40 per cent of its passengers from communities of less than 10,000. This survey indicates that in 1941 the traveling public made the great majority of out-of-town trips for personal rather than business reasons and that 40 per cent of these trips were from 50 to 250 miles in length, with only 10 per cent over 250 miles.

The 50 to 250-mile segment in all likelihood comprises the major portion of local airline potential traffic. The relatively small number of trips over 250 miles by all modes of transport indicates that interconnection with short haul surface transport media may become of even greater importance to local airlines than interconnection with trunk airlines.

A recent traffic check by Greyhound shows that the average trips of residents of cities of over 50,000 are twice as long as those of the residents of towns less than 50,000—180 compared with 90 miles. The extremes are 61 miles for towns under 1,000 and 220 miles for cities over 500,000. Whereas only 22 per cent of the 60,000,000 people in the villages and towns served by Greyhound lived in communities of less than 50,000 these communities provided 64 per cent of the passengers and 46 per cent of the passenger miles. As 66 per cent of the country's population and 64 per cent of Greyhound's passengers live in towns and rural communities of 50,000 or less, Greyhound apparently gets a very good cross-section of the country's population.

New Hampshire-born, Harvard '25, the author joined Air Investors early in 1929, later was an officer in several corporations. He came to Washington after Pearl Harbor, since 1943 has been assistant to William A. M. Burden, assistant secretary of commerce.

This bus travel picture is in contrast with that of the existing airlines and is certainly more closely comparable to the prospective traffic of local airlines. Airline passengers today average over 500 miles (just under 400 before the war) per trip and over 90 per cent of the population of communities certified for airline passenger service live in cities of over 50,000 and 50 per cent in cities over 500,000. Only 288 communities in the U.S. are certified for airline passenger service whereas Greyhound serves over 6,000 communities.

Comparison of air, rail, and bus passenger traffic, other than commutation, for 1941 is as follows:

	Pull-man	*Air Coach*	*Rail*	*Bus*
Number of passengers.....	1%	5%	50%	44%
Passenger miles...	4%	30%	39%	27%

According to compilations of the ICC, ODT, and CAB some 465,000,000 intercity passengers were carried by rail, bus, and airlines in 1941 (as against some 12.5 billion by automobile). Apparently about half (232,000,000) of these traveled less than 50 miles, roughly 20 per cent (93,000,000) traveled 50 to 100 miles, another 20 per cent 100 to 250 miles and 10 per cent (46,500,000) over 250 miles.

Thus there are some 200,000,000 bus and rail passengers and an immeasurable number of automobilists who travel annually distances over which they could save hours, days and nights away from home and business by using local airlines. This is a substantial base on and from which to build a faster, more comfortable, and more convenient air transportation business. Travel by air will presumably continue to be three or four times as fast as practically all surface means.

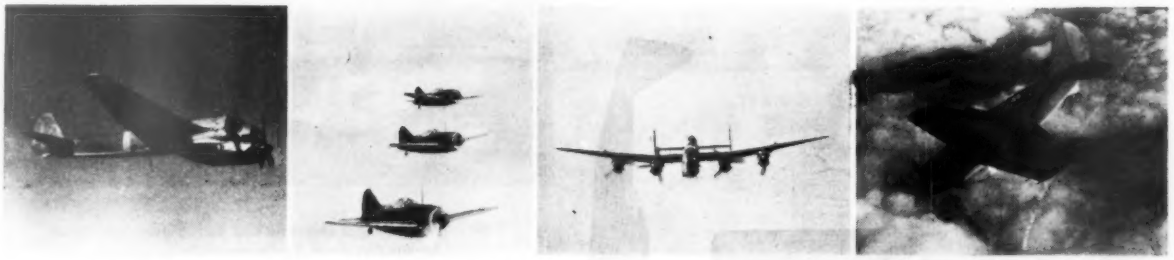
The important place of the small community in this relatively short haul travel picture is further emphasized by an on-and-off check by the Greyhound Corporation on several of their routes which are about 250 miles long. This check developed the facts that nearly 60 per cent of the passengers get both on and off at intermediate points; nearly 40 per cent get on at intermediate points and go to a route terminal and only five per cent go from one terminal to the other on a single route, not to mention intermediate points on connecting routes.

Thus it appears that an extensive system of local airlines operating over routes connecting with two or more market centers and inter-connecting with routes of local air and surface transport as well as trunk airlines, at terminal and intermediate points, could be made to provide services that would find ready markets and could become practically free of subsidy mail rates in a relatively short period.

The size, characteristics and the degree of readiness of these markets cannot be fully determined by the operation of a few experimental local airline routes. However, such operations would give some concrete indications of what can be expected in the future. A few carefully selected experimental operations with generous mail rates could presumably be set up within the next six months. They would need only a small number of planes. Some 10,000 miles of routes and 40 planes flying two round trips a day would do the job.

(*Continued on page* 122)

FOR IDENTIFICATION



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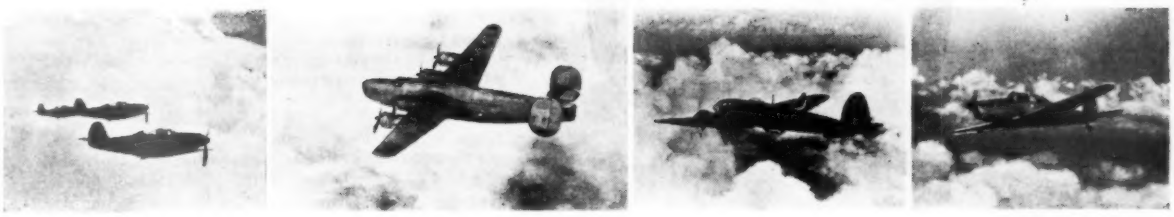


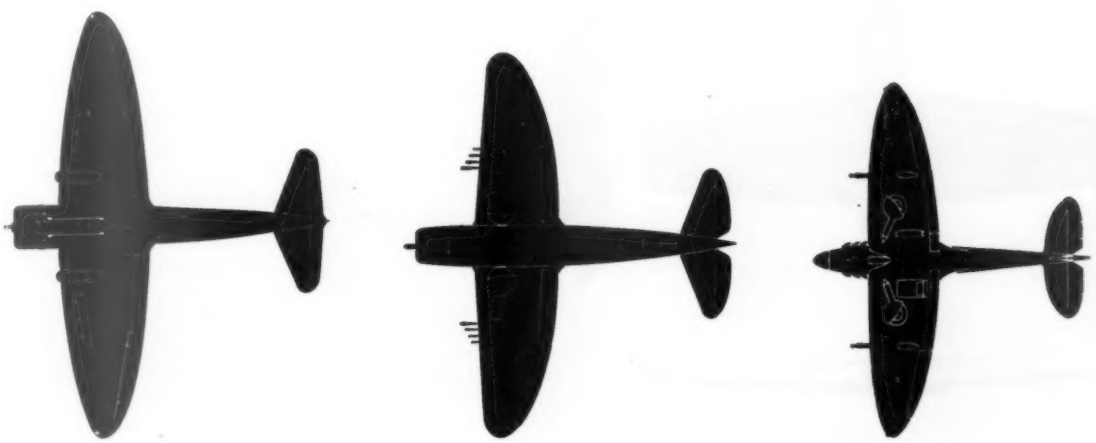
5 6 7 8

The planes are: 1. Junkers Ju-88; 2. Brewster Buffalo; 3. Avro Lancaster I; 4. Curtiss Helldiver; 5. Bell Airacobra; 6. Consolidated Liberator Express; 7. Heinkel He-111; 8. Arado Ar-96B.

MISTAKEN IDENTITIES

THREE currently-used military aircraft, that are distinguished by their elliptical wings, may be confused. Two—the Republic *Thunderbolt* and Supermarine *Spitfire*—are Allied types; the third is the Jap Val dive bomber. They are shown here to scale.

Copyright, FLYING, June, 1944



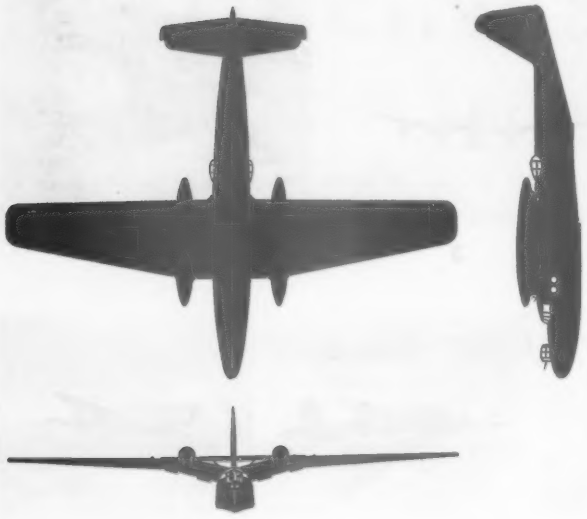
Val (Aichi K-99) span: 47 ft. 8 in.

Republic Thunderbolt span: 40 ft. 9 in.

Supermarine Spitfire span: 36 ft. 10 in.

DORNIER Do-26

Patrol Bomber



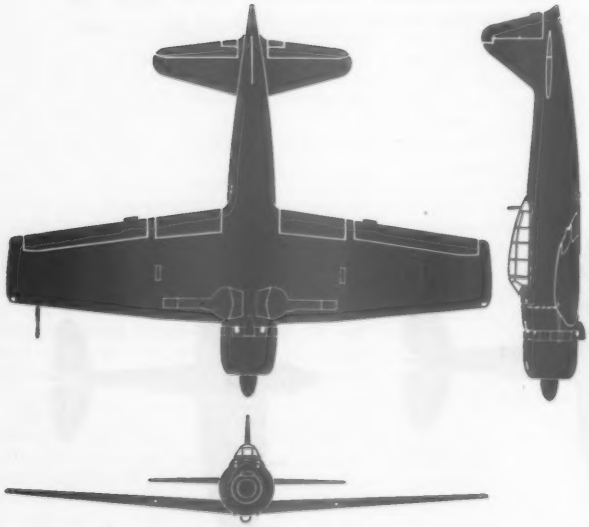
PERTINENT FACTS: A four-engined flying boat, the Do-26 is used by the Germans for long-range reconnaissance. Powered with four 750-h.p. Junkers *Jumo* engines, the Do-26 is estimated to have a range of 5,600 miles. Top speed is 208 m.p.h., cruising speed, 193 m.p.h. Wing span is 98 ft. 6 in., length, 80 ft. 6 in.; height, 22 ft. 6 in. Gross weight is 44,100 pounds, empty weight, 22,500 pounds. There are four men in crew. Two of the engines are pushers and can be raised during take-offs to keep the props out of spray.

WHAT TO LOOK FOR: A high, gull-winged monoplane, the Do-26's cantilever wing has leading edge taper and a straight trailing edge. In the front view, it closely resembles the Martin *Mariner*. The four in line engines sit low in two nacelles. The boat hull sits low in the water. The single tail unit is externally braced.

Copyright, FLYING, June, 1944

HAMP

Fighter



PERTINENT FACTS: A newer modification of the widely used Jap Zero fighter Zeke, Hamp is almost identical to Zeke except that it has square wing tips. Technically the Mitsubishi S-00-2, the Hamp is powered with an air-cooled 1,200-h.p. Kinsei engine. Top speed is 350 m.p.h. at 17,000 feet and range is 1,000 miles. Wing span is 36 ft. 3 in., length, 30 ft. 3 in.; height, nine feet. Armament is two 20-mm. cannon and two 7.7-mm. (about .30-caliber) machine guns.

WHAT TO LOOK FOR: The conventional low wing is cantilever and has slight dihedral. Both edges taper to the square tips. The fuselage looks somewhat like the old American Curtiss *Mohawk*, having a high cockpit canopy and conventional single-tail unit. An oblong belly fuel tank frequently is carried under the center section.

Copyright, FLYING, June, 1944

AIRCRAFT OF THE U. S. ARMED FORCES

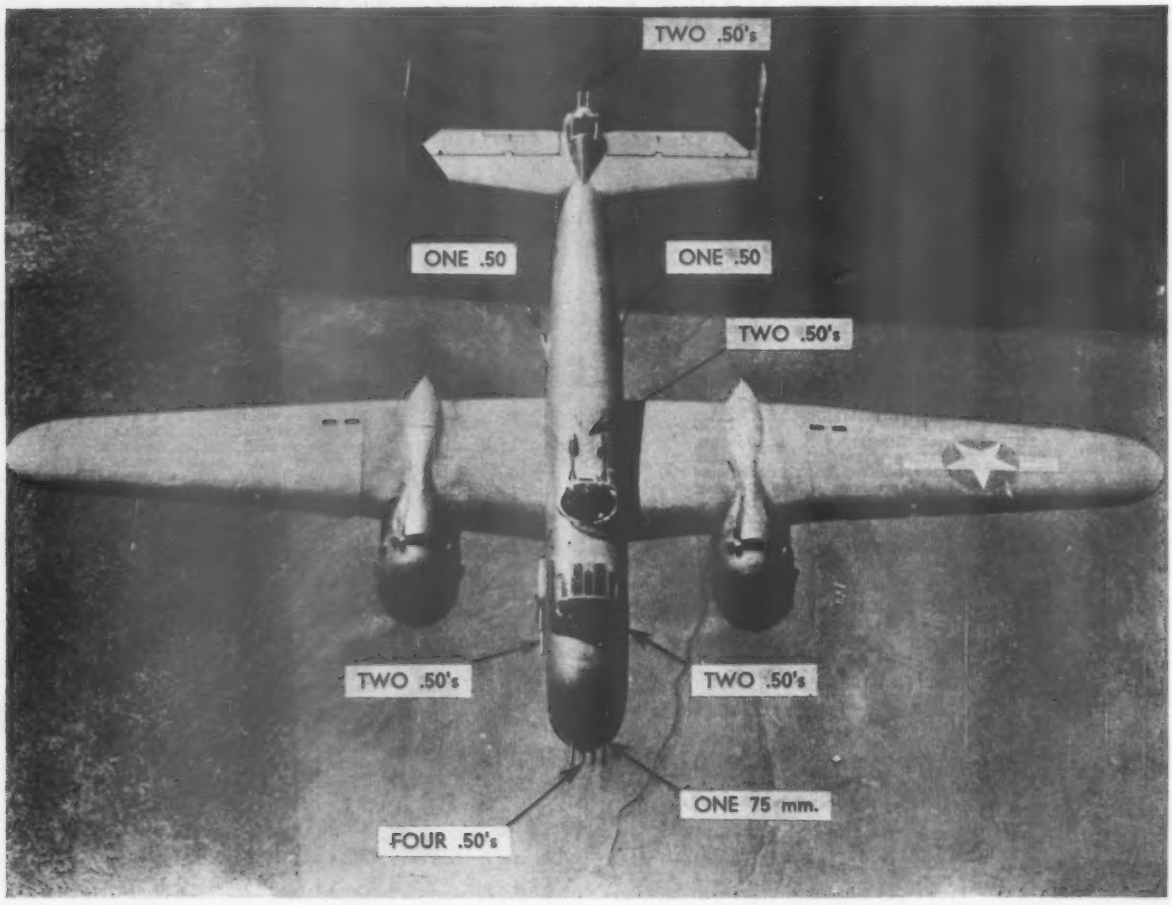
All aircraft known to be in use by the United States armed forces about which information is releasable are contained in the following list of planes. A number of experimental models also are included. The list has been compiled carefully by the editors of FLYING from authoritative sources and is believed to be even more complete and accurate than a similar list recently made public in a joint Army-Navy release.

Army	Navy and Marine Corps	Name	Designer
HEAVY BOMBERS			
B-17	.....	Flying Fortress [1]	Boeing
B-24	PB4Y	Liberator [1]	Consolidated Vultee
B-29	.....	Superfortress	Boeing
XB-32	.....	(Not yet named)	Consolidated Vultee
B-40 [9]	.....	Flying Fortress (guns only)	Boeing
MEDIUM BOMBERS			
B-18	.....	Bolo [2]	Douglas
B-23	.....	Dragon [3]	Douglas
B-25	PBJ	Mitchell [4]	North American
B-26	.....	Marauder [1]	Martin
B-34	PV	Ventura [1]	Lockheed
LIGHT BOMBERS			
A-20	BD	Havoc (Attack) [1, 4]	Douglas
A-24	SBD	Dauntless (Dive)	Douglas
A-25	SB2C	Helldiver (Dive)	Curtiss
A-26	.....	(Improved version of A-20)	Douglas
A-29	PBO	Hudson [1] (Patrol)	Lockheed
A-30	.....	Baltimore [1]	Martin
A-31	.....	Vengeance I [1] (Dive)	Consolidated Vultee
A-34	SB2A	Buccaneer [1] (Dive)	Brewster
A-35	.....	Vengeance II (Dive)	Consolidated Vultee
A-36	.....	Mustang [5] (Attack)	North American
.....	SB2U	Vindicator [2] (Dive)	Vought
.....	TBD	Devastator [2] (Torpedo)	Douglas
.....	TBF	Avenger [1, 6] (Torpedo)	Grumman
.....	TBY	Seawolf [7] (Torpedo)	Consolidated Vultee
FIGHTERS			
P-38	.....	Lightning [8]	Lockheed
P-39	.....	Airacobra [8]	Bell
P-40	.....	Warhawk [1, 8]	Curtiss
P-43	.....	Lancer [10]	Republic
P-47	.....	Thunderbolt	Republic
P-51	.....	Mustang [1]	North American
XP-59	.....	(Jet plane, not yet named)	Bell
P-61	.....	Black Widow	Northrop
XP-62	.....	(Not yet named)	Curtiss
P-63	.....	(Not yet named)	Bell
P-66	.....	Vanguard	Consolidated Vultee
P-70	.....	Havoc	Douglas
.....	F2A	Buffalo [2]	Brewster
.....	F4F	Wildcat [1, 11]	Grumman
.....	F6F	Hellcat [1]	Grumman
.....	F7F	Tomcat (tentative)	Grumman
.....	F4U	Corsair [1, 12]	Vought
PATROL BOMBERS			
OA-10	PBY	Catalina [1]	Consolidated Vultee
.....	PBN	Nomad (version of Catalina)	Naval Aircraft Factory
.....	PB2Y	Coronado	Consolidated Vultee
.....	PBM	Mariner	Martin
SCOUT OBSERVATION			
.....	SO3C	Seagull	Curtiss
.....	OS2U	Kingfisher	Vought
O-52	.....	Owl	Curtiss
TRANSPORT AND UTILITY*			
C-33	.....	DC-2	Douglas
C-43	GB	Traveler	Beech
C-45	JRB	Voyager	Beech
C-46	R5C	Commando	Curtiss
.....	R3D	(None; same as DC-3)	Douglas
C-47	R4D	Skytrain [1, 13]	Douglas
C-49	R4D	Skytrooper [1, 13]	Douglas
C-53	R4D	Skytrooper [1, 13]	Douglas
C-54	R5D	Skymaster	Douglas
C-60	R5O	Lodestar	Lockheed
UC-61 [16]	GK	Forwarder	Fairchild
C-62	.....	(Not yet named)	Waco
UC-64	.....	Norseman	Noorduyn
C-67	.....	Dragon (Converted from bomber)	Douglas
C-68	.....	DC-3 [13]	Douglas
C-69	.....	Constellation	Lockheed
UC-70	GH	Nightingale	Howard
UC-71	.....	Executive [14]	Spartan
UC-72	.....	(S&E cabin biplanes)	Waco
C-73	.....	Old 247D airliner	Boeing
XC-74	.....	(Not yet named)	Douglas
C-75	.....	Stratoliner	Boeing
UC-78	JRC	Brass Hat	Cessna
C-79	.....	Ju-52/3 m. (Captured from enemy)	Junkers
UC-80	.....	PJC [14]	Harlow
UC-81	.....	Reliant	Vultee (Stinson)
C-82	.....	(Not yet named)	Fairchild
UC-83	.....	Cub Coupe [14]	Piper
UC-86 [16]	.....	Forwarder	Fairchild
C-87	RY	Liberator Express	Consolidated Vultee
UC-94	.....	Airmaster [14]	Cessna
UC-96	.....	Model "71" [14]	Fairchild
XC-97	.....	(Not yet named)	Boeing
C-98	B-314 [14]	Clipper	Boeing
XC-99	.....	(Not yet named)	Consolidated Vultee
.....	JR2S	Excalibur	Sikorsky
.....	JRM	Mars	Martin
.....	M-130 [14]	Clipper	Martin
.....	R3O	Twelve	Lockheed
.....	J2F	Duck	Grumman
OA-9	JRF	Goose	Grumman
OA-14	J4F	Widgeon	Grumman
TRAINERS			
PT-13 & 17	N2S-1 & N2S-3	Caydet	Boeing
PT-19 & 23	.....	Cornell I	Fairchild
.....	N2T	Tutor	Timm
PT-22 & 25	NR	Recruit	Ryan
PT-26	.....	Cornell II	Fairchild
.....	N3N-3	(Not yet named)	U. S. Navy
BT-13 & 15	SNV	Valiant	Vultee
AT-6	SNJ	Texan [1]	North American
.....	SNC	Falcon	Curtiss
AT-7	SNB-2	Navigator [15]	Beech
AT-8 & 17	.....	Bobcat	Cessna
AT-9	.....	Jeep	Curtiss
AT-10	.....	Wichita	Beech
AT-11	SNB-1	Kansas	Beech
AT-18	.....	Hudson	Lockheed
AT-19	.....	Reliant	Vultee (Stinson)
AT-21	.....	Gunner	Fairchild
AT-24	.....	Mitchell	North American
LIAISON			
L-1	.....	Vigilant	Vultee
L-2	.....	Taylorcraft Grasshopper	Taylorcraft
L-3C	.....	Aeronca Grasshopper	Aeronca
L-4B	NE	Piper Grasshopper	Piper
L-5	.....	Sentinel	Vultee
L-6	.....	Interstate Grasshopper	Interstate

1. Also used by the British.
2. Obsolete, but still used for miscellaneous work.
3. Also used by the Russians.
4. The name *"Havoc"* in this case is confusing. It originally was named *"Boston"* by the British (who first used the airplane). The RAF named only its night fighter version *"Havoc"*; so did the AAF with the P-70.
5. Sometimes referred to as the *Invader*.
6. Also built by General Motors as the TBM.
7. Original design by Chance Vought.
8. A photo-reconnaissance version of the *Lightning* is designated F-5A.
9. Originally used to protect large formations of bombers, the B-40 is not now in action.
10. Only a small number built. Used by Chinese Air Forces and at U.S. fighter bases.
11. Also built by General Motors as the FM.
12. Also built by Goodyear (FG) and Brewster (F3A).
13. The differences between the C-47, C-49 and C-53 are as follows: The C-47 has a large cargo door and a heavy floor and is powered by Pratt & Whitney R-1830 engines. The C-49 has a regular airline-size door and is powered by Wright *Cyclone* engines. The C-53 is the same as the C-49 except that it is powered by Pratt & Whitney R-1830 engines. All three planes are based on the commercial Douglas DC-3. The C-68 is a DC-3 with 21-place regular airline interior.
14. Manufacturer's designation.
15. A photo-reconnaissance version of the *Navigator* is designated F-2.
16. The Fairchild *Forwarder* with Ranger engine has been designated UC-86; the UC-61 has a Warner engine.

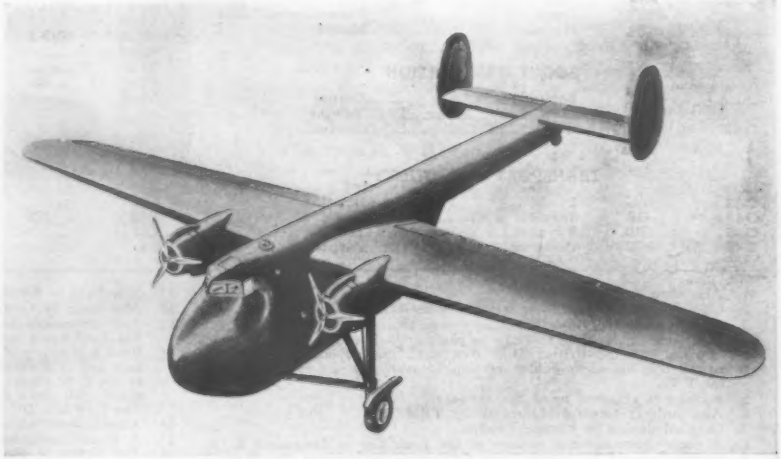
*NOTE: Cargo planes of less than 15,000 pounds gross weight are designated UC (Utility Cargo).

HAVE YOU SEEN?



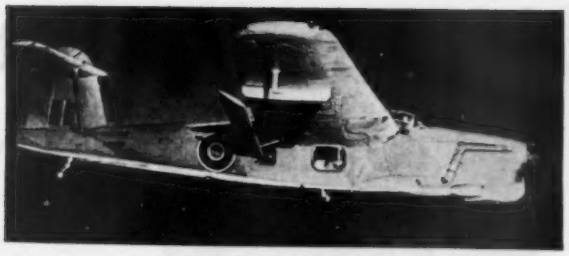
Deadliest medium bomber in the world, this version of the North American Mitchell carries 14 .50 caliber machine guns and a 75-mm. cannon, as well as a small bomb load. An even later version is a bomber with 14 guns but no cannon.

New air gunners' flak helmet uses small steel squares and sponge rubber padding.

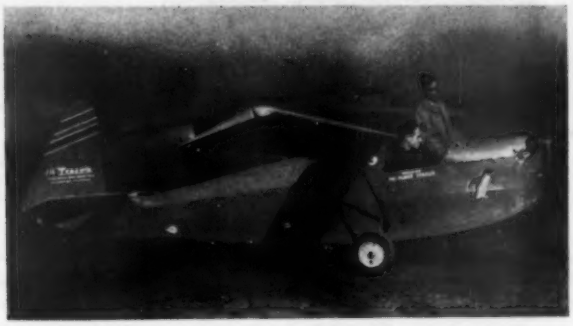


Another proposed AAF cargo plane is the Waco C-62. This sketch of the plane, which first appeared in the Waco house organ, shows the fixed landing gear, twin engines and rudders.

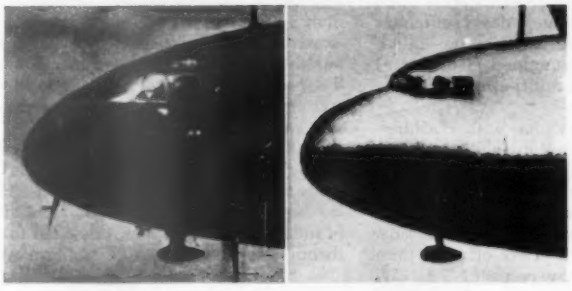
Carrier-based U. S. Navy planes successfully attacked Tarawa despite the relatively ineffective Jap radar unit in the background.



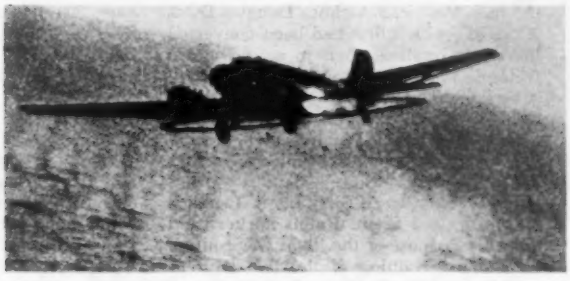
Fairey Barracuda is latest Fleet Air Arm torpedo plane (see page 28). It has 1,260 h.p. Merlin engine, crew of three. Wing span is 49 feet.



This Penguin J-16 pre-flight ground trainer is powered with a 7 h.p. engine, is "flown" along the ground on its wheels at 10 or 15 m.p.h.



Curtiss Commando nose (left) soon will be modified to look like the sketch at right, now appearing in Curtiss-Wright advertising.



A German Junkers Ju-52 fitted with a magnetic mine-exploding ring is shown being shot down in flames by a Hawker Typhoon's cannon.

There are approximately 128 incendiary bombs in this cluster, being dropped on an enemy objective by an AAF Liberator. Each incendiary weighs four pounds. As each lands, the thermite and magnesium ignite, burning five seconds at 2,000° Centigrade.

I Learned About Flying From That!—No. 57

The author

by

Capt. W. J. HULL

This is one of the most unusual articles we have ever published. It is an account—one of very few we have seen—of a major airplane accident in which the pilot not only survived, but was able to write a detailed record of what took place. Captain Hull is a Pennsylvania-Central Airlines pilot and, at the time of this accident, was checking out Army pilots in the operation of the C-47 (DC-3). His graphic account is published herewith, through the co-operation of the Air Line Pilots Association, which first published it in its official publication.—Ed.

WE took off from Woodrum Field, Roanoke, Va., May 2, 1943, in a former American Airlines Douglas DC-3, NC-21793, which first had been converted to freight-hauling, then to an advanced training plane for use in the A.W.T.I. program. The engines were 1,000-h.p. G-102 Wright Cyclones. It was considerably lighter than a standard DC-3, having being stripped of luxurious fittings and upholstery.

In the crew were First Lieut. Leonard A. Smith, 2nd Lieut. Ralph Parker, and myself. Purpose of the flight was routine transitional training of the two lieutenants; it was the first flight for each in this type airplane. Lieutenant Parker had over 200 hours flying time; Lieutenant Smith's time was over 1,500 hours—about 700 of them in twin-engined airplanes as an Army Air Forces multi-engine instructor.

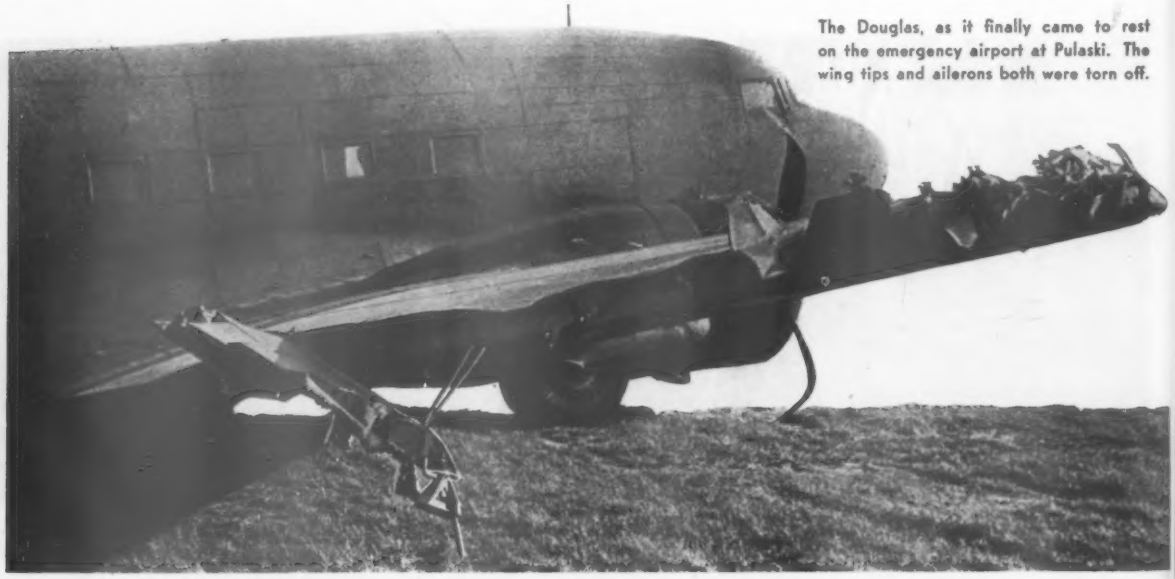
After filing a flight plan with Washington Airways Traffic Control for a CFR (Contact Flight Regulations) flight within a 100-mile radius of Roanoke, we took off. With Lieutenant Smith serving as co-pilot and Lieutenant Parker observing, I took off to the west. Take-off and climb were normal in every respect. The airplane flew very well except that it was slightly nose-heavy during take-off. Nothing about its performance indicated anything amiss.

The air was slightly turbulent in the lower layers up to about 4,000 feet, becoming gradually smooth above that. Ceiling and visibility both were unlimited and high, thin clouds ahead of an approaching warm front existed over the country where we intended to fly. An occasional rain shower was visible from the cockpit but these were light and well scattered. I noticed the fall of the outside air temperature gauge from force of habit and noted that a normal lapse rate existed, indicating the presence of a stable air mass over northern Virginia and southern West Virginia. It was an excellent evening for the kind of flying we wanted to do.

After climbing to 3,000 feet above sea level, Lieutenant Smith took the controls and proceeded to make 15° bank climbing turns, according to my instructions. After reaching 7,000 feet we leveled off about 20 miles northwest of Roanoke airport. We proceeded with about 20 minutes of familiarization with the operation of landing gear and flaps, maintaining a northwest heading. After Lieutenant Smith had demonstrated proficiency in the operation of these, we flew on out into the two north quadrants of the Pulaski range, where he practiced steep turns and stalls. The turns did not exceed 45° nor more than 140 m.p.h. indicated air speed. We slowed down to 65 m.p.h. during stalls, but the nose never was very high above the horizon. None of these maneuvers was the least bit severe or abrupt in any way.

With Lieutenant Smith's excellent background on multi-engined airplanes, he proved to be an excellent student. Having satisfied myself with his technique in the former maneuvers, I decided to run through a few "unusual position" ma-

(*Continued on page* 88)



The Douglas, as it finally came to rest on the emergency airport at Pulaski. The wing tips and ailerons both were torn off.

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ALSO GET YOUR AVIATION BOOKLET—"Piper Cub . . . In War and In Peace". Full color, 32 pages. Covers history of light plane, Piper Cub planes, coming air age, how to fly. Enclose 10c in stamps or coin for postage-handling. Write Piper Aircraft Corporation, Department PA64, Lock Haven, Pennsylvania.

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Letters

405 OR 406?

Sirs:

On page 23 of your April issue is shown a photo of a Morane-Saulnier MS-405. I have seen this same photo captioned as an MS-406 several times. Which model is it and if it is the MS-405, what is the difference between the 405 and 406?

HUGH YOUNG

Winnipeg, Canada

● The French described the plane as the 406, but tail markings clearly indicated it was the 405. The specifications for each plane as reported by Jane's "All the World's Aircraft" in different years, are identical. Probably the 406 is the production version of the 405.—ED.

ANTI-SKY MARKERS

Sirs:

Mr. Cleaves article on "Signposts of the Air" (April FLYING), leaves me very much in doubt as to what type of pilots the backers of this idea expect to find flying when the war is over.

It seems to me that anyone who can't learn to navigate by pilotage and dead reckoning should never be issued a flying license now or anytime.

It would be like turning out a combat pilot with training only in contact navigation and neglecting radio entirely.

What do they want—a bunch of signpost-reader pilots? I'm for very strict license requirements later on.

LIEUT. PAUL C. HASSLER
Greenwood Army Air Field

Greenwood, Miss.

● Pilot Hassler undoubtedly has had many tens of thousands of dollars spent on his air training by the Army Air Forces. Many post-war pilots cannot have these advantages. FLYING believes that there can be no mass flying activities after the war without the greatest simplification of both private plane operation and regulations consistent with reasonable safety. Without mass flying there can be no mass production of reasonably-priced planes and without both, pilots like Lieutenant Hassler probably will not be able to afford private flying at all.—ED.

WHAT'S COOKING?

Sirs:

Your WASP article hit home with me. I spent six months at Avenger Field as a Civilian Pilot Training Program student pilot in the ATC.

I started flying in 1929 as a hobby and my money went for every hour I got until 1939. I owned and flew planes built in the last war and have built and flown my own planes. I have time in almost every type of plane that they put OX-5's and Hissos in and a lot of later types—750 hours in all. My instruction was given me by two pilots, one a leading racing pilot and the other a leader in our air force in England.

I gave up flying in 1939 as I had to devote all my time to my business which in 1942 was paying me about $8,000 a year. Then came the war and a telegram from the CPT stating the War Department needed ATC pilots and co-pilots and I could start right in on the advance 10-week course and, on completion, go into the Army.

I started CPT school in Chicago in September, 1942. After one week we were called to active duty and sent to Sweetwater, Tex., for further training. After weeks of drilling and waiting we found out we were not to receive any instruction from the Army but would get checked out in Army planes.

When we were on the flight line we were asked what CPT training we had. When our check pilots found we had none they told us we did not have the background and that the Army did not have time to train us.

During the six months we were there we were well fed and had good quarters but we got the pay of Army privates. . . .

About a month before we were to leave we were told we would be discharged and not recommended for further duty. Two weeks before we left, about 150 girls came to this same field. We soon found out they were there to learn to fly. A few had a fair amount of time but they needed only 35 hours to qualify and they were to get Primary, Secondary and Advanced, plus two-engine time—all from the Army—and at $150 per month.

Yes, they had the background with 35 hours, but we did not with 200 hours up to 2,000 hours. I wonder why?

Jacqueline Cochran says this training will make better mothers out of these girls. I would like to know if she thinks that a little infantry training for these experienced pilots at $50 per month as buck privates will make better fathers of us?

Let's get the lid off and see what's cooking.

DONALD MCGOUGH

Downers Grove, Ill.

WE'LL BE SEEING YOU

Sirs:

We are the little fellows who tinker with jaloppy engines, save a few bucks and fly an hour on Sundays. We have built our hours in the air with sweat; no college, no backing by a rich dad. We have gone it alone, seeking our heart's desire—*flying*.

Our country goes to war and we offer our services. Everywhere it is the same. Army, Navy, Marines, Coast Guard. "Sorry Son, we can't use you." No college, no money, over age, no big shot pull or backing. Thousands of us trained and no place for us.

So the draft comes and we are placed everywhere in the fighting forces except flying. We are the best damned pilots in the world, rotting away in the infantry.

We sit in a foxhole on some South Pacific island or in a slit trench down in Italy and watch the young punks fresh from college wabble all over the sky despite their training and get splattered all over the ground with thousands of dollars worth of hot airplane wrapped up in smoking ruins around their necks. . . .

When we get back, watch for us. We will rule the sky as never before, because we learned the hard way. We'll be seeing you.

A FORGOTTEN PILOT

Overseas.

WRONG ANSON

Sirs:

May I offer a correction on your picture designated Avro *Anson V* in your April issue. This is the *Anson II*, two Jacobs 915-7-L6MB engines of 325 h.p., fixed pitch wooden propellers, welded tube type fuselage.

The *Anson V* has fuselage of resin-bonded plastic plywood and two Pratt & Whitney 450-h.p. engines with Hamilton or Hoover variable pitch propellers.

Anson II.

Anson V.

L. R. MORRISON

Winnipeg, Canada.

Sirs:

. . . . It is an Avro *Anson II* . . . .

GEORGE A. HUMISTON
First Lieutenant, A.C.

Stockton Field, Calif.

Sirs:

. . . The only way the *Anson V* could meet the speed you mentioned (197 m.p.h.) would be to put it into a dive. . . . The maximum speed attainable (military rating) and for a period not longer than five minutes is 194 m.p.h.

The picture is the *Anson* Mark II.

J. JACQUES MESSIER
Flying Officer, RCAF

Summerside, P.E.I., Canada

Sirs:

. . . About the only way this airplane could reach a speed of 197 m.p.h. would be in a terminal velocity dive. However, the optimistic English red-lined it at 213 m.p.h., the realistic Americans at 160 m.p.h.

I flew this particular airplane (No. 38223) 25 hours. . . .

MAJ. R. B. ASBURY
Army Air Forces

Minter Field, Calif.

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SAYS W. C. MENTZER,
Chief Engineer,
United Air Lines, Inc.

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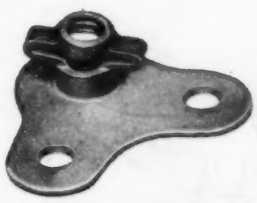

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THE LIBRARY

SOLAR RELATIONS TO WEATHER AND LIFE, two vols., by Henry Helm Clayton; published by the Clayton Weather Service, Canton, Mass. 105 and 439 pages. Price $3 each.

Of the many investigators who have maintained that conditions on the sun are a major factor in the determination of daily weather phenomena on the earth, and that methods could be developed for making weather forecasts, especially long-range forecasts, on the basis of solar phenomena, probably H. H. Clayton should be considered as among the foremost—both because of the large amount of work and long period of years that he has devoted to research on this problem, and also because of the qualifications he possesses by virtue of his extended practical meteorological experience and his other meteorological investigations. Furthermore, in much of his work he has had the advantage of association with the Smithsonian Institution where so many valuable solar data have been accumulated under the direction of C. G. Abbot.

Twenty-nine of the original research papers published by Clayton during the past 60 years are reprinted in the second volume of the present treatise, together with three papers by other authors; a brief introduction describes the significance of each paper for the general problem of the relation of solar conditions to meteorological and other terrestial phenomena. With the index, this volume covers 439+xv pages. The first volume, of 105 pages, is a general discussion summarizing the results of the detailed investigations and the present status of the problem; it includes chapters on the yearly and daily cycles in the meteorological elements, solar variability and weather, solar cycles and weather cycles, forecasting the weather, solar cycles and life cycles, and the hypothesis of the planetary cause of sunspots; a supplement on the cold waves of the winter of 1942-43 in relation to solar activity is inserted in the volume.

Research on this problem is being actively continued by Clayton and others. The discussion here presented by Clayton on the basis of studies extending over a period of 60 years, and the original papers from many scattered sources now made conveniently available in collected form, should be of great value to anyone who plans to do similar work.

EDGAR W. WOOLARD
Meteorological Physicist
U. S. Weather Bureau

MAN IN THE AIR, by Herbert S. Zim; published by Harcourt Brace & Co., in New York. 332 pp., illustrations. Price $3.

This is a well written and factual presentation of the effects of flying on the human body. The author brings out clearly and cleverly blends the relationship between the physical variables encountered aloft as the result of gradually lowering atmospheric pressure and temperature, and the physiologic response and adjustments of the human organism to such an abnormal environment.

In non-technical language that will appeal to most readers, he paints a picture of conditions aloft so as to bring out the limitations of the human factor in flight. He describes the ocean of air in which we live and fly, the adjustments necessary in negotiating extremely high altitudes, oxygen systems, pressurized cabins, pressurized suits, physical tests and physical fitness, etc., in the manner of an unfolding story which makes for highly entertaining, as well as informative reading. There isn't a dull chapter in the entire book. It is exceptionally well-illustrated with official photographs and diagrams and drawings.

Quite appropriately the author dedicates his work "to the flight surgeons whose efforts have helped make modern flying possible."

The layman interested in the human aspects of flying, those who man our planes, and flight surgeons will find this book to be a worthwhile addition to their reference library.

COL. A. D. TUTTLE, M. D.
Medical Director
United Air Lines

FLYING

"I'm staying right here until you move over."

SHORT VIEWS

INFANTRY JOURNAL READER, selected and edited by Col. Joseph I. Greene. Published by Doubleday, Doran & Co. 675 pp. Price $3.

Selections from the *Infantry Journal* designed to give the soldier perspective on and the layman a better understanding of war.

AIRCRAFT ENGINE TROUBLE-SHOOTING CHART, arranged by Andrew Wallace, Crew Chief, Eastern Air Lines, Inc. Published by Norman W. Henley Publishing Company. 1 page. Price 75 cents.

Single-page wall chart designed to help locate source of trouble in all types of aircraft engines.

AERODYNAMICS OF THE AEROPLANE, by W. L. Cowley. Published by the Ronald Press Company in 1944. 201 pp. Price $2.25.

Textbook designed to advance the person with an elementary knowledge of aerodynamics. Covers action of air on surfaces, airfoils, propellers, aerodynamic measurements, etc.

GAS TURBINES AND JET PROPULSION FOR AIRCRAFT, by G. Geoffrey Smith, M.B.E. Published by Aerosphere, Inc., in 1944. 80 pp. Price $1.50.

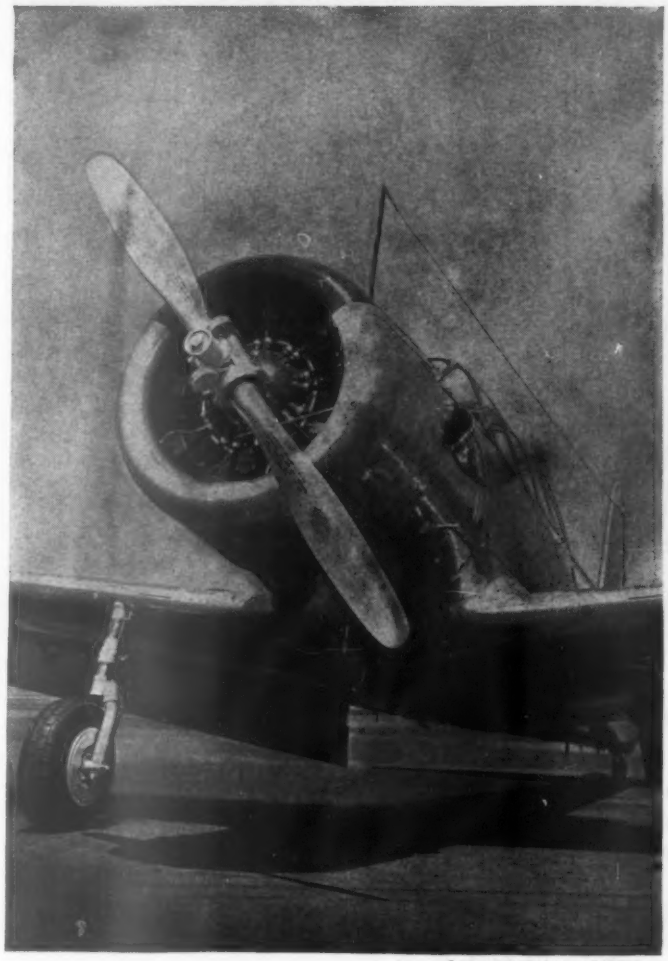
Revision of Mr. Smith's book published in England by Flight Publishing Co., Ltd., with two additional chapters on latest developments. Probably is most comprehensive material available to general public.

CIVIL AIR PATROL HANDBOOK, 1944 Edition. Published by Southern Flight, Dallas, Tex. 287 pp. Price 50 cents.

Revised edition of manual containing most information required by an officer or member of CAP in ordinary operations, excepting for restricted information and Army manuals required for certain courses.

MATHEMATICS FOR NAVIGATORS, by Comdr. Delwyn Hyatt, USN (Ret.) and Comdr. Bennett M. Dodson, USNR. Published by McGraw-Hill Book Company, in 1944. 106 pp. Price $1.25.

Elementary book for navigation students. Reviews addition, subtraction, algebra, logarithms, plane geometry and spherical trigonometry, suitable for review course or for students who have never studied these subjects.



Courtesy Consolidated Vultee

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in the Laboratory in Service Tests and in Combat

There has been no guesswork about U.S. Royal Airplane tires. Every tire in the line has been tested in the laboratory, tested again under the closest observation in service . . . and then subjected to the most severe test of all . . . actual service.

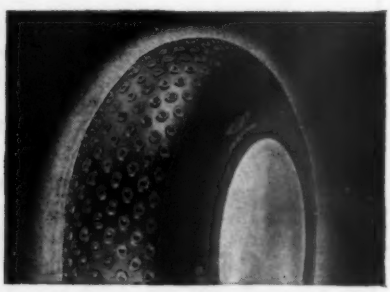
The U.S. Royal Block Tread has proved itself on fighters, bombers and commercial airliners on almost every kind of landing strip . . . on our airports at home and on emergency landing fields in Africa, Italy and the South Pacific. Scientifically engineered for the greatest traction and serviceability, the U.S. Royal Block Tread is a standard among airplane tire designs. With the switch to synthetic rubber treads, the U.S. Royal Block Tread is again proving its stamina.

The U.S. Royal Ice Grip with its positive, non-skid grip on icy runways, the U.S. Channel Tread and the U.S. Royal Plain Tread nose and tail wheel tires each does its own specialized job safely and dependably on test . . . and in service.

SERVING THROUGH SCIENCE US TO SPEED THE VICTORY

U.S. ROYAL SMOOTH CONTOUR TAIL WHEEL TIRE . . . Like every U.S. Royal Airplane tire, the tail wheel tire is available in Static Conductor Construction to protect the plane and crew from static shock. Specially designed for the stresses and strains of tail wheel service.

U.S. ROYAL SMOOTH CONTOUR BLOCK TREAD . . . The sharp edges of the U.S. Royal Block Tread protect against either forward or lateral skids...give sure-footed safety in landings and take-offs and deliver long, dependable service. It is the leader of the "U.S." Airplane Tire line.



U.S. ROYAL SMOOTH CONTOUR ICE GRIP . . . This radically different type of airplane tire tread design originated by United States Rubber Company has proved in tests on ice covered landing fields its ability to cut through ice and bring the plane to a safe, sure stop.

UNITED STATES RUBBER COMPANY

1230 SIXTH AVENUE • ROCKEFELLER CENTER • NEW YORK, 20, N. Y.

Active service pays off!

Crown engineers' field-experience in adapting Crown Zippers to meet special military jobs will pay big postwar dividends to you!

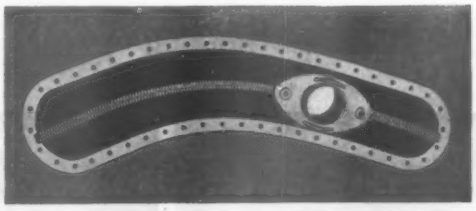
When this war started, Crown Zipper engineers went right out into the field with our armed forces to develop zippers for tents, sleeping bags, aircraft covers, and countless other military items.

Crown engineers were also called on to *redesign* hundreds of existing closure applications—and out of this experience came some of the most amazing developments in zipper history.

Today there's a Crown Zipper that actually slides freely around curves—a zipper with *ten* sliders on one track, providing smooth closures in both directions—zippers that are big and tough, yet easy to operate—zippers that are small and dainty, yet virtually indestructible! (See list of Crown superiorities below.)

When the war is over, Crown's tremendous backlog of experience will prove invaluable to aircraft manufacturers. For our designers will be able to sit down with your designers and adapt—or, if necessary, *create* —special Crown Zipper features to meet special jobs.

Remember, when *you* turn to postwar planning: Crown Zipper designs aren't frozen—Crown adapts the zipper to the job.



NEW "Double-Acting" Crown Zipper on airplane gun turrets opens ahead of gun, closes behind it, protecting gunner from cold.

CROWN ZIPPERS are 5 ways better

1. Takes sharp curves

2. Die-cast for smoother action—extra strength

3. Provides opening wherever you want it

4. Won't lock open

5. Resists corrosion

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THE SPOOL COTTON COMPANY • *745 Fifth Avenue, New York, N. Y. (Crown Fastener Division)*

Continental Red Seal Engines

Your Dollars are Power, Too!
Buy War Bonds and Keep Them.

POWER TO WIN

Each precision-built Continental Red Seal Engine has passed rigid laboratory and operating tests and has the endorsement of Continental engineers. This in itself means true Red Seal Quality in research, design, manufacture and performance.

Experience is a great teacher and it will long be remembered by aircraft manufacturers, pilots and fixed base operators that the Continental Motors Corporation pioneered the light aircraft industry. It was in 1931 that Continental produced the first light, air-cooled flat-opposed 4 cylinder type of aircraft engine. The results are now history. The industry has had a healthy and substantial growth and Continental has more than kept pace.

ARMY E NAVY

Awarded to the Detroit and Muskegon Plants of Continental Motors Corporation for High Achievement.

Continental Motors Corporation
Aircraft Engine Division
MUSKEGON, MICHIGAN

AIRCRAFT OWNERS AND PILOTS ASSOCIATION

AOPA NEWS

The Aircraft Owners and Pilots Association (AOPA) with National Service Office located in the Carpenters Bldg., Washington, and Registrar's Office in the Michigan Square Bldg., Chicago, is a non-profit organization composed exclusively of pilots. It looks after the pilot's best interests in all phases of aviation and helps individual pilots with their individual problems. The AOPA operates with a full-time professional staff and is the largest group of civilian pilots in the world. This column is edited by the Aircraft Owners and Pilots Association and opinions contained in it are not necessarily those of FLYING. A special Bulletin is sent each month to all registered AOPA pilots and also confidential memorandums from AOPA's Washington staff are sent members from time to time.

OF interest to all pilots is the new McCarran Bill, known as S. 1790, which will be reviewed in the AOPA *Pilot* (confidential bulletin sent to registered AOPA members) in the near future. The McCarran measure calls for a number of things including the re-establishment of the CAA as an independent government agency and the Civil Aeronautics Board as an independent investigating agency. The administrator of CAA was made responsible to the secretary of commerce under the President's Reorganization Plan No. IV of May, 1940. Copies of the proposed bill may be obtained by writing to the Document Room, U. S. Capitol, Washington, D. C.

Companion bills known as H. R. 4269 and S. 1797 have been introduced in the House and Senate which, if passed, would provide: "That any member of the armed forces on active duty status who has satisfactorily completed, under the Civil Aeronautics Administration war-training-service program, the primary, secondary, and cross-country flight courses, and either the elementary-instructor course or Link-trainer course, shall be granted a commission as a second lieutenant in the Army, an ensign in the Navy, or a second lieutenant in the Marine Corps, as the case may be."

As we go to press, no formal action has been taken on any of the above measures. Members will be kept posted.

SILVER AOPA WINGS AVAILABLE

AOPA has just received a new shipment of sterling-silver lapel wings which are available to members only. A dollar bill sent to the Washington Service Office address will start one on the way. In writing, members should give their AOPA pilot registration numbers.

SAFETY BUREAU DOES IT AGAIN

The Safety Bureau, Civil Aeronautics Board, headed by **Jesse W. Lankford**, has again earned well-deserved congratulations from all private pilots for its release on proposed revisions to Part 20, CAR, pertaining to pilot certificates. This follows rapidly on the heels of the proposed changes to Part 60, Air Traffic Rules. An AOPA *Washington Newsletter* has been circulated to all members covering the details of the proposed changes to Part 20.

Now that the ball is rolling, AOPA pilots hope the Safety Bureau will keep on the job until all remaining parts of the CAR have been similarly simplified and cut down.

LOST MEMBERS

We have lost track of the following AOPA pilots and are holding mail for them in the AOPA offices. Anyone knowing their present addresses, please notify the AOPA Registrar's Office.

John S. Cooper, AOPA 347
Harry L. Ford, AOPA 3749
Charles E. Hall, AOPA 2680
D. O. Johnson, AOPA 8466
Leah Shepherd Johnson, AOPA 4568
F B Millson AOPA 8478
Thomas J. Thompson, AOPA 6878
George H. Wilber, AOPA 667

AIRPLANE BUYERS NOTE

AOPA officials have been advised by Washington headquarters of WTS that former owners of aircraft taken over by Defense Plant Corporation for War Training Service programs and present licensees are being given priority rights to repurchase aircraft currently posted on released aircraft lists issued by the CAA Regional Offices. Envelopes containing priority bids must be sealed and marked on the front left-hand corner with the name and address of bidder, the NC number of the airplane for which the bid is submitted, and an appropriate statement as follows:

"Priority bid by former owner of NC ....."

or

"Priority bid by present licensee in possession of NC... ...."

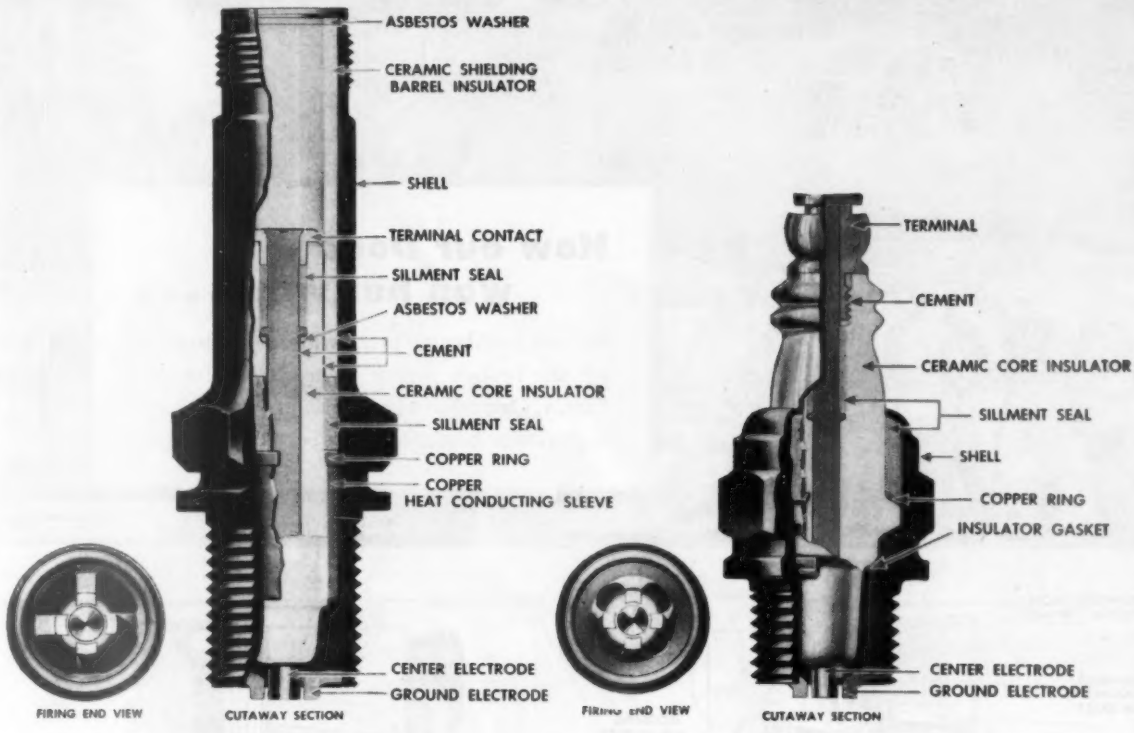
Priority will be given in the above order.

Warning: All AOPA pilots who have made bids or who intend making bids on aircraft *should inspect the aircraft they propose to purchase.* Most CAA regions have pointed out the need for persons to inspect the airplanes. The notice issued by the Second Region reads as follows:

"In the sale of surplus DPC aircraft on which bids are being invited from time to time, it is planned to include aircraft in all manner of condition, from complete washouts, except for salvageable parts, to excellent certificated aircraft.

"Because of the fact that no representations or warranties can be made concerning the condition of aircraft offered for sale, it is therefore impossible to des-

(Continued on page 88)



No Aircraft Spark Plug Is Better Than Its Insulator

Considering the wide diversity of service, climatic and atmospheric conditions encountered by the air forces of our armed forces, it is truly remarkable how few types of Champion Spark Plugs are required to meet all needs of practically all engines in service throughout the world.

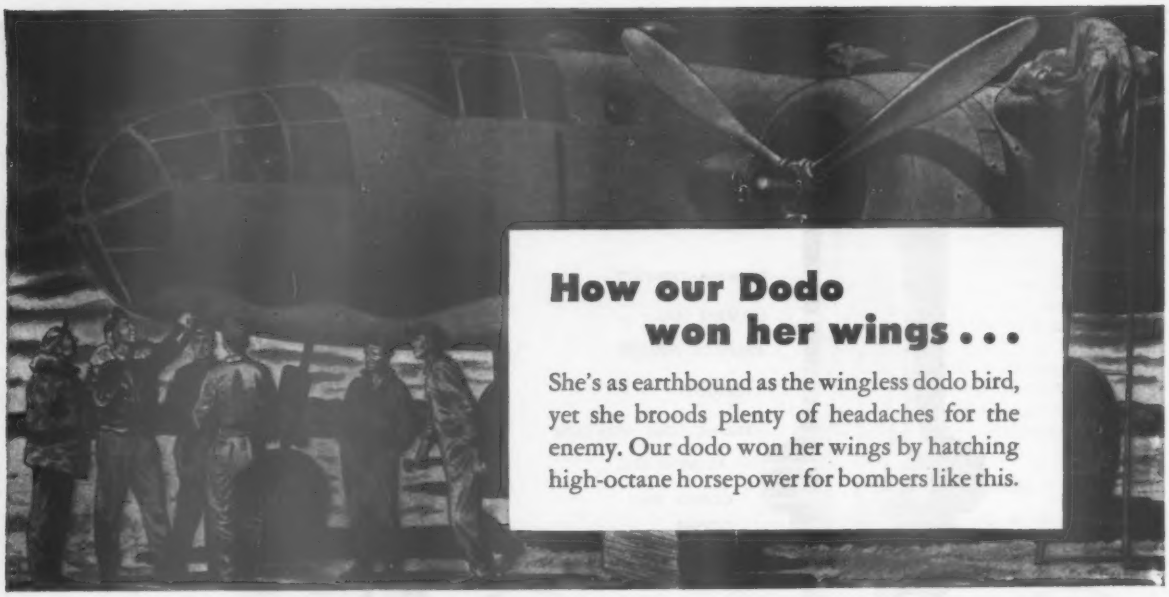
The fundamental reason for this is to be found in the specially developed insulating material used in Champion Aircraft Spark Plugs. Possessed of unequalled dielectric strength, resistance to heat and mechanical shock, and being practically impervious to moisture, fuel and oil absorption, the insulating efficiency of Champion insulators is highly stable under the widest variations in temperatures and pressures.

The development of such an outstanding spark plug insulating material is the direct and natural result of more than thirty years devoted *exclusively* to the production of quality spark plugs. Champion's Ceramic Division is by all odds the most comprehensive and advanced—its research and engineering facilities unequalled—in the spark plug field.

Since their introduction the demand for Champion Aircraft Spark Plugs has continued to accelerate unabated. Today they are in service and being shipped in quantities which reach astronomical figures, which cannot now be revealed.

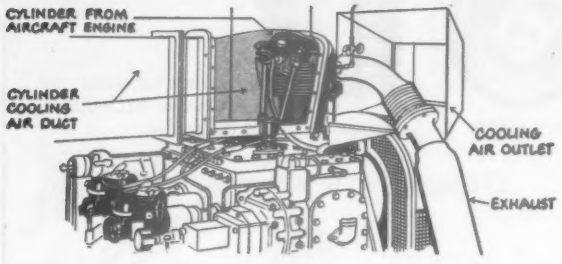
CHAMPION SPARK PLUGS

INSTALL CHAMPIONS AND FLY WITH CONFIDENCE

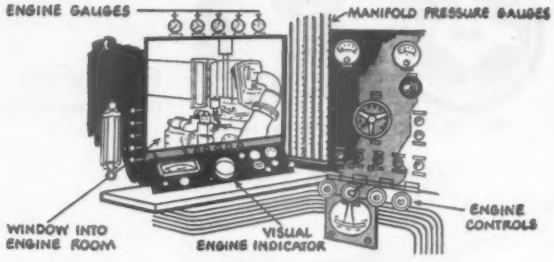


How our Dodo won her wings . . .

She's as earthbound as the wingless dodo bird, yet she broods plenty of headaches for the enemy. Our dodo won her wings by hatching high-octane horsepower for bombers like this.

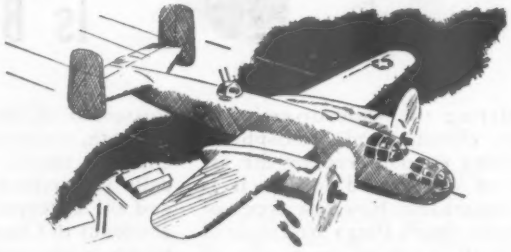


TO "FLIGHT-TEST" new aviation fuels in the laboratory, Standard of California research engineers use this special test equipment. Its most important feature is a complete single-cylinder assembly taken from a regular aircraft engine. A cylinder from any type or model of engine may be used.



THOUGH OUR DODO never leaves the ground, its laboratory "flights" simulate conditions of actual service. These involve full-power take-off, climb, and cruise throttle settings that produce greater power output than required in the air. From such tests, flight performance of fuels can be predicted.

BEFORE A NEW FUEL is okayed for flight, the cylinder assembly in which it was tested is examined minutely. Any deposits on valves, any corrosion or other sign of instability sends the fuel back to have the wrinkles ironed out. Standard gasoline must be performance-perfect before it goes aloft.



MANY NEW FUELS have won their wings on Standard's "dodo." Many more have flunked this final test in the laboratory grind. And we're prouder, perhaps, of the failures . . . because they hint at how really good aviation gasoline must be before it's good enough to wear Standard's "wings."

STANDARD OF CALIFORNIA

"I'M FROM MISSOURI!"

Due, perhaps, to the skepticism which is native to my breed—plus the experience gained from years of dealing with garrulous mule skinners—I was inclined to take very little stock in this talk of a glider hop to Burma.

"Personally," I said to my stablemates, "I'm from Missouri. They'll have to show *this* mule!"

Well, sir, show me they did. Because this is Burma and I surely didn't get here on the Staten Island ferry.

Naturally, I've had to take quite a ribbing about the whole thing. But that's nothing compared to what the Nips have taken since we've opened up these landing strips out here. When I think of the kicking around they're going to get from now on—I can "eat crow" and like it! THE WACO AIRCRAFT COMPANY, Troy, Ohio, U. S. A.

First in Sicily and now more recently in the Burma jungles—where they made surprise landings laden with engineers, jeeps, mules and road grading equipment—army cargo-transport gliders have demonstrated their effectiveness in delivering men and equipment to (and beyond) the front. Designed by WACO *. . . manufactured by* WACO *and 11 other companies using* WACO *engineering supervision . . . the performance of these gliders holds for you the promise that the plane you will want to fly tomorrow will come from* WACO.

Waco

WACO AIRPLANES

ALL ARMY CARGO-TRANSPORT GLIDERS ARE WACO DESIGNED

(*Continued from page 84*)

ignate them as "washouts," "repairable" or "certificated." Therefore, it behooves everyone, for his own protection, to inspect or have a representative inspect for him all aircraft on which he plans to submit bids."

FLYING BANS

The War Department has recently issued a new pronouncement on the policy of national defense known as Circular No. 80, dated February 23, 1944, which, among other things, reiterates the authority for and continuation of the Western and Eastern Vital Defense Areas.

Flight of civilian aircraft within these areas is restricted to those aircraft which the CAA will authenticate as being operated for purposes directly related to the war effort. Civil training is specifically prohibited within the Vital Defense Areas under the newly adopted policy. Although not a relaxation, it is expected that some essential civilian flying in the interest of the war effort will now be permitted in these areas which had previously been excluded by the rigid requirements of the military establishments during the period when submarine attack was considered imminent. Meanwhile, Civil Air Patrol units under direct Army supervision have started to operate on specified military projects on both the eastern and western seaboards, which has given some encouragement to local pilots in the affected areas.

In answer to complaints received by AOPA from west coast pilots that Civil Air Patrol personnel from other sections were being imported in the newly organized west coast CAP activities, National Headquarters of CAP has advised AOPA that "the reason for placing pilots from various parts of the country on west coast assignments is that CAP is a national organization and aviation does not have state boundaries. The policy of CAP is to share flying missions as equitably as possible among qualified personnel throughout the organization rather than give them exclusively to the pilots in the areas where the missions happen to be." END

The French Fly Again

(*Continued from page 69*)

all day long and oddly enough, dispatchers who a few months ago would have thought the idea preposterous, fire the language right back at them without giving it a second thought though their accents may be somewhat rough and ready.

A French cadet may say, "Cadet Vauthier cheeking een with Mr. Jones," or he may say, "*Cadet Vauthier rentrant avec Monsieur Jones.*" In any case operators know the answers, for most of the routine answers are pasted upon the wall in front of them.

Likely enough, pretty 19-year-old dispatcher Margaret Jiminez, hearing there is something wrong with a plane, will spout, "*rapportex cela au mecano, s'il vous plait,*" when a few months ago she would have merely said, "report that to a mechanic."

The French are "eager beavers" in the truest and best sense of the word. So anxious are they to learn that they listen intently to English instructions even though they do not understand them until interpreted

Many have developed the habit of making notes in both English and French in order not to miss anything, and to aid them in merging the two languages more quickly.

Behind this eagerness are several good reasons. These Frenchmen do not take their flight training as a matter of course. In North Africa they passed three different examinations to qualify for the course. They consider it the opportunity of their lives and intend to make the most of it. Unanimously they look at flying as a quick means of avenging themselves on the Germans, whom they hate with a bitterness not understandable to those whose families have not received the Nazi "treatment."

Finally, with their conception of good manners and politeness, they cling to an instructor's every word for fear of not seeming to appreciate his efforts in their behalf.

That is why in this strange country which they call *le paradis*, the French are models of attentiveness—why they are determined to speak English before they go to the next phase of their training at the AAF Basic Flying School, Gunter Field, Ala., and to speak it fluently by the time they reach the advanced school at Craig Field, Ala. That is why, too, they steel themselves against any misgivings they might have for learning the whims of a strange machine taught them in a strange tongue.

These Frenchmen—many of them mere boys—show an almost fatalistic stoicism developed in the hardship of the past four years.

Some of them are officers who escaped in French air corps planes. Many made their way through the French underground.

All these men have the feel of their board-and-straw beds plastered forever against their tough backs. They know what it is to be rationed to the point of poverty and to march shoeless in the desert.

"Do you like us?" coyly fished an American hostess of a French officer recently.

The Frenchman reddened and expanded noticeably, "Madame," he said stiffly, "I refuse to answer such a question. It is as though this lamp asked you, 'Do you like my light?'"

That's the way the French feel about it. They have a phrase for everything; and on the day when they are qualified to meet the Germans on an equal basis in the sky, they will have a phrase for the hard-boiled American instructors who are working overtime to give them a break.

"*Merci beaucoup, Monsieur!*" . . . "Thank you."

And that is as much as any man can say. END

I Learned About Flying . . .

(*Continued from page 76*)

neuvers with him by placing the airplane in unusual positions and, at a given signal, asking him to effect the recovery. He was not under the hood.

We had climbed to about 10,000 feet for these maneuvers and now were flying over mountainous southern West Virginia, about half way between Princeton and Beckley. The terrain ranges from 2,000 feet to over 4,000 feet in this area and I wanted considerable altitude for these unusual positions so that we would have a comfortable safety margin.

After putting the airplane in slow-flying position, climbing turns, steep turns, and near stalls, from all of which Lieutenant Smith recovered satisfactorily, I placed the airplane in a descending left bank about 20°, the engines cruising at about 23 inches and 1,850 r.p.m. When the air speed indicated 190 m.p.h. he took over at my signal, but his recovery was attempted with not quite enough back pressure on the control column I did not grab the controls but attempted to coach him into a recovery. But after the indicated air speed reached 210 m.p.h., I placed my hands and feet on the controls to demonstrate the amount of back pressure and rudder required to effect a recovery before allowing the plane to accelerate near the placarded true indicated air speed (252 m.p.h. on this airplane). I immediately learned why he had allowed the ship to reach an air speed too high for safety. It was our belief at the time that the airplane had 600 pounds of ballast in the rear baggage compartment. We learned later that it had been removed for some unexplained reason. This condition, coupled with the fact that we were flying an empty airplane, caused an extreme nose heaviness which was greatly exaggerated by its altitude and high air speed.

By this time the indicated air speed stood between 230 and 240 m.p.h. and the

(*Continued on page 92*)

"SEAT-OF-THE-PANTS" FLYERS LAUGHED — BUT

Dick Merrill stayed with the Link!

Chief Link Trainer Instructor Harry Martin, of Eastern Air Lines, discusses recent improvements in the Link with Capt. Dick Merrill

When Eastern Air Lines standardized on Link Training for pilots in 1937, Capt. H. T. (Dick) Merrill had been flying the big "Silverliners" for eight years.

Merrill was quick to evaluate the remarkable ability of the Link Trainer to reproduce conditions of actual flight. He became an untiring student of instrument flying. His enthusiasm got a laugh from some flyers of the "seat-of-the-pants" school, but Dick continued to spend much of his spare time in the Link.

Now sixteen years with Eastern, Merrill has nearly three million miles to his credit. For the Military Transport Division of Eastern Air Lines, he has flown military personnel and materiel around the world. Among Merrill's feats are two outstanding records: *first* to fly the Atlantic Ocean both ways; *first* to fly the Atlantic round-trip with payload.

On the return leg of that round-trip flight to London, the weather was bad; with low ceiling, poor visibility, rain. Thanks to instrument flying skill, the crossing was "routine."

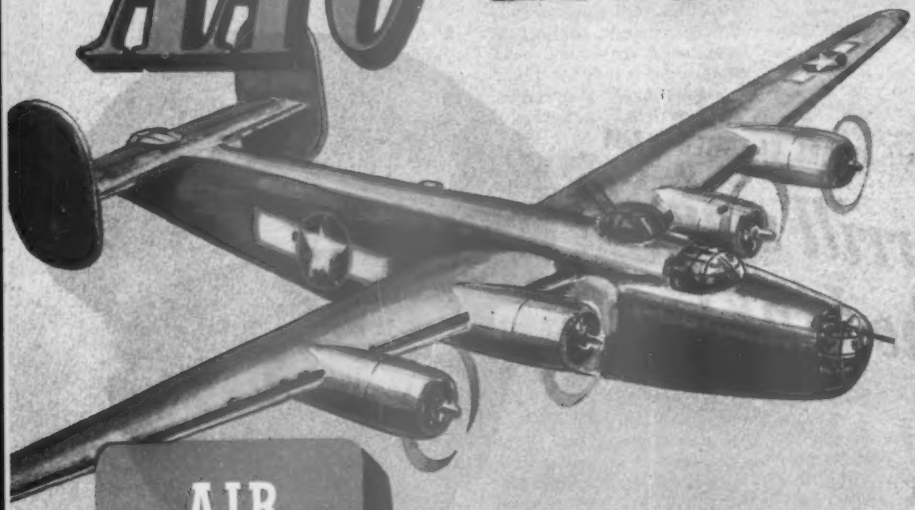
Dick Merrill has probably spent more time in the Link Trainer than any other pilot of his length of service.

LINK AVIATION DEVICES, INC.
Binghamton, New York

LINK MANUFACTURING COMPANY, LTD., Gananoque, Ontario

Link Trainers, Aviation Sextants, and other products contributing to the safety of flight

AAC ENGINEERED



AIR

Brake control valves and other hydraulic actuating equipment for military and commercial aircraft.

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Hydraulic engine, clutch and steering controls for marine craft; also winch controls.

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ARMY NAVY

AIRCRAFT ENGINEERED POWER

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POWER CONTROLS

AIR · VACUUM · HYDRAULIC · ELECTRIC

TODAY, AAC Engineered Power Controls are serving the United Nations in their victorious war effort, as standard equipment on such famous aircraft as the Liberator, Lightning, Vega PV-2, Constellation, Catalina, and others. Important new aircraft, now in the making, also will be equipped with hydraulic controls engineered and produced by AAC.

TOMORROW, AAC Engineered Power Controls will be ready to serve a world at peace, not only in the air but on the land and sea, as well. The facilities and know-how that have made us a leading supplier of high precision controls for aircraft, already are at work in developing new and improved controls for commercial motor vehicles, Diesel engines, marine craft, industrial machinery and equipment. *Look to AAC for a solution of your own power controls problems, now and after the war.*

POWER CONTROLS DIVISION

Burbank, Calif.

(P-44)

LAND

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(*Continued from page* 88)

plane was accelerating rapidly. The controls at this speed were extremely heavy and resisted our combined strength to move them.

I gave the elevator trim tab a couple degrees of roll to ease the nose up and reached for the throttles when, without any warning whatsoever, we struck a terrific updraft off the mountains. The concussion was tremendous. This "bump" at 240 m.p.h. was worse than anything I had ever experienced, even in a summer thunderstorm. The impact floored Lieutenant Parker, who was standing in the companionway, and it caused all three of us almost to lose consciousness for a moment. Lieutenant Smith described it later as "almost like hitting a brick wall."

Without looking out the window I knew there had been a structural failure; the control wheel was locked to any aileron motion whatsoever. To confirm my suspicions, I hastily looked out the cockpit window at the wing and saw a sight I shall never forget. The left wing tip had folded upward at its junction point with the wing and broken off, leaving only a mass of jagged, torn metal where it had been. Even worse, the aileron also had been pulled out of the wing and blown away. Only a short inboard section six feet long remained of the original 24-foot aileron—and that section was hanging by a single hinge, fluttering in the slipstream. Lieutenant Smith then reported that the right tip and aileron also had sheared off and blown away.

The Douglas immediately went into a very steep spinning dive to the left, somewhat like an ordinary spin, except that we were "winding up" much faster. The ship revolved very rapidly around its longitudinal axis—so fast that centrifugal force nearly blacked us all out. It was headed straight down—not almost straight down, but *straight down*. It did at least three turns before I could start to think what had happened. We all nearly lost our senses as we watched the earth rushing madly up at us. The jolt we had just sustained had almost knocked us out, and I recall it was with a mighty effort that I kept myself conscious.

Lieutenant Parker was pinned tightly to the floor on his back in the companionway and was unable to move, according to his subsequent report. But the dive was so steep he was able to see the earth coming up at us between his feet, through the windshield. The air speed needle had long since moved clear off the dial; the rate-of-descent indicator had gone around so many times I couldn't count the turns of the needle. The plane was descending at a terrifying rate of speed, setting up a terrible shrieking sound. All the wreckage on the stubs of the wings, the control cables and bell cranks dangling straight back into the slipstream, contributed to the loud whistle of air over the windshield as the big plane spun earthward at ever-increasing speed.

When the rudder resisted all my efforts to move it with both feet on the right pedal, I screamed at Lieutenant Smith to get on it with me. But he had already done so, realizing that we were in very serious trouble. Even with the control wheels locked to any aileron motion, we both by sheer instinct tried to turn the dual control wheels against the turn—so hard that it is a wonder we did not break them off. But still we could not move any control on the airplane.

After at least five or six turns of this terrific spin (please do not doubt this), I futilely attempted to stop the spin with full inboard engine. With the props flattened, I applied full power to the left engine and pulled the right throttle clear back. The plane was shrieking so loudly that we couldn't even hear the landing gear warning horn blow and my efforts with the left engine served no other purpose than to make the ship go down faster. It had no effect at all on the spin. By this time we three had about resigned ourselves to a crash from which we could not possibly have survived.

We were diving at a speed which Douglas engineers later estimated at between 250 and 300 m.p.h. and, having made another two or three turns, we knew the earth was getting perilously close. Finally, almost silly with fear and with a super-human effort, I went for the rudder trim tab control. I had rolled it desperately over to the right, possibly to the full extent of its travel, at the same time pushing right rudder and pulling on the control column with all my might. Although our memories for the next half-minute or so are rather vague, we all agree that the ship spun another turn or two, then came out in a screaming chandelle to the right. We must have all blacked out; I have a haunting memory of seeing out of the corner of my eye wooded mountain sides going past the window, but from there on for the next 10 or 20 seconds we all must have been unconscious.

When I first recovered, my head was on my chest turned to the right facing Lieutenant Smith, who likewise was in a slumping position. He was regaining his wits but his eyes were still sunk deeply behind his cheek bones and his jowls hung down from his jaw bones, even though he is a slender lad. Having nearly abandoned hope, I could scarcely believe my eyes when I noted that the ship was recovering. A quick glance out the window showed me that we were headed upward very steeply in a sharp climbing turn to the right. I kicked hard on left rudder; its heavy pressure reminded me that we had full right tab on. I quickly neutralized the tab, rammed the nose down automatically because the air speed indicated 140 m.p.h. and was falling back rapidly, and applied power to the right engine. The left engine still was wide open from my attempted recovery with it. I reduced it to about 30 inches and adjusted the right throttle to the same setting.

By some stroke of luck the ship came back to an even keel. Using the engines and what control surfaces we had left, I trimmed for level flight, at the same time trying to get my breath back and get my heart started again. The ship had been almost ready to spin to the right as we regained our senses and caught it.

When we straightened out at the top of the chandelle at 140 m.p.h., we were on a northwest heading at approximately 4,000 feet above sea level. None of us know exactly at what altitude we were when the rudder tab took effect and started our recovery, but it could not have been more than a few hundred feet above the rugged terrain. Later, we were told that one witness on the ground started out to hunt the wreckage because, having seen us go out of sight behind a

(*Continued on page* 96)

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(*Continued from page 92*)

hill and not having observed our recovery, he assumed that we had crashed.

He said broken wing tips, sections of ailerons and bits of torn metal and fabric rained down around him for a few time after we had disappeared from his view.

We could do nothing but simply sit and try to hold the plane straight and level. It was nearly impossible to do anything else with the plane. The condition was not unlike being balanced on a tight wire with scarcely any lateral stability. We kept very busy watching that a wing did not get down more than 4° or 5°; any time a wing would get down more the plane would start to fall off again into another diving turn. Our rudder was the only method we had of raising a low wing, consequently we could not adopt any desired compass heading.

Fearing another spin at our low altitude I decided to try to gain some precious altitude before doing anything else. We realized we were in a desperate position and altitude seemed of most importance at the moment. Applying 35 inches of mercury to each engine, we struggled carefully back up to 6,000 feet and leveled off. This altitude was above the slight turbulence near the ground and I started experimenting very gingerly with the plane to see if I could learn its capabilities.

We found it possible to achieve a very small degree of turn by using the rudder to skid the airplane, but if much rudder was used the inside wing would go down and another diving turn would result. Our turning radius was so small that a 180° turn required a radius of from 12 to 15 miles in diameter. By retarding one engine a little below the other we were able to get a small amount of turn, but any radical reduction of power on one engine caused the wing on that side to drop toward another incipient spin. The elevator controls worked very well at all times and, if used gently, did not disturb the ship laterally. Much as I would like to have determined the plane's stalling speed, I thought it foolhardy to attempt an approach to a stall at any altitude. We all felt that we could never survive another such spin.

It was still difficult for us to believe that we would be able to pamper the ship around and be able to make a landing from which we could walk away. We were flying over very rough terrain with mountain peaks all around us, some of them over 4,000 feet high. Realizing we must attempt a landing before long because of approaching darkness, I tried to think of an airport or any landing area, near enough to reach before dark, that would have a long, open approach on the downwind side. This last requisite was absolutely mandatory because we could not maneuver the ship around any obstructions near the ground on the approach and would necessarily be forced to get "squared off" several miles away so that we could make a long, fast, drag-in approach to maintain some semblance of lateral stability. We had no idea what our stalling speed would be, so a relatively fast approach was imperative.

Because of the jagged peaks surrounding Roanoke airport, we realized we could never hope to maneuver the ship to a safe landing there. So we headed for Pulaski.

Pulaski's small 2,800 x 400-ft. sod CAA emergency landing field lies northeast by southwest, parallel with the wind we knew existed on the ground. Its long open approach down the broad New River Valley from the northeast was the predominating factor in my decision to attempt to land there. The sod surface, too, seemed more attractive for a belly landing than asphalt. Long ago we had decided that our high stalling speed would require a landing with the wheels up if we tried to get onto anything under a 3,500-foot runway.

The mere weight of Lieutenant Parker walking back into the cabin for a map caused the ship to change its angle of attack quickly and dangerously. Because of this we realized that dropping the gear might cause us to spin in immediately. So we elected to try to get into Pulaski on the belly.

I was tempted for a time to fly on farther south, down toward the Greensboro-Winston-Salem area where the terrain becomes only slightly rolling, but the late hour prohibited this decision. The approaching darkness likewise discouraged the thought that it might be possible to lower three parachutes into the escape hatch of the cockpit from another airplane flying above us. There simply was no use wasting any more time; we had to get into Pulaski within a half hour.

Not being certain of our exact position because of the nature of the flight we had been conducting, but feeling sure we were north of Pulaski, I painstakingly eased the ship around until we reached a south heading. Then, stealing only a second at a time from the difficult work of flying the plane, I tuned in the Pulaski range station on the automatic direction finder. But the needle refused to point toward the station no matter how meticulously the signal was tuned. It wandered all around and proved to be absolutely worthless.

But the "N" signal we were hearing almost had to be the northeast quadrant and not the southwest, so we decided to hold the south heading and fly for the build-in signal we felt sure would come. It was futile to attempt any kind of orientation problem with an airplane which could not be turned around in a circle of less than 12 to 15 miles in diameter. Very soon we began to get a strong build-up in signal, proving our assumed position to be correct.

Although we had called Pulaski Radio at least four times, using the word "emergency" repeatedly, we were unable to raise the station. It was my thought to report to them the exact circumstances of the accident and describe the condition of the airplane so that, if we did fail to get down alive, the investigators would have something tangible on which to base our crash. Lieutenant Smith, Lieutenant Parker and myself were still resigned to cracking up, because we just simply did not believe we would be able to get the plane down.

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ing. Any degree of accuracy in an approach would be so critical that it had to be exactly right or a crack-up was inevitable. We did not believe our judgment good enough to cope with the situation. But every mile the airplane flew, every minute it remained aloft, we gained a little more confidence.

About five minutes after my last attempt to raise Pulaski Radio, the operator came on the air with a call to us. Although he had not been able to reach us because of the static in the approaching front, Roanoke Radio—45 miles to the northeast—was able to hear our emergency call clearly and the operator relayed our message to Pulaski, advising him to work us. We responded immediately to his call, attempting to describe our mishap and describing the condition of the airplane and, at the same time, requesting surface wind direction and velocity at Pulaski. He acknowledged our message and came right back with the wind, southwest 14, which was exactly on the landing strip with that good approach from the northeast. I requested him to have ambulances and fire equipment standing by with engines running, that we were going to attempt a belly landing on the southwest runway. He acknowledged and stated that he would comply with our request.

We were still about 20 miles north of Pulaski when we noted with concern that our flight path was going to carry us almost exactly into a rain shower of small dimension, yet large enough that we could not fly around it because of our slow turning radius. I was reluctant to plow into it, fearing control of the plane would get away from us if we were forced to go on instruments. We tried hard to avoid the shower, but too much pressure on the rudder caused the ship almost to fall off again, so there was nothing to do but go through it. Fortunately, it was only slightly turbulent inside—but we had our hands full for a few minutes until we broke out on the other side.

The first thing we saw was the town of Pulaski and the tiny airport 4,000 feet below. We had crossed the last range of mountains, so I eased off the hard-laboring engines a little and started letting down, planning a large circle to the left that would bring us out on the northeast on-course signal which exactly lines up with the landing strip.

We were considerably provoked to see a crowd of 2,000-3,000 people surrounding the airport and hundreds of automobiles swamping the one highway from the city to the field. Apparently they had deserted their Sunday dinner to follow the ambulances and fire equipment to the airport to witness a probable crash. We were determined to disappoint them.

I assigned Lieutenant Smith to cover any radio contacts on the let-down and approach, the radio master switch, and the flap valve. I could not find anything for Lieutenant Parker to do without changing his position in the ship, so he stood by to rush back through the cabin and open the door as soon as we hit. We still had over 600 gallons of gasoline aboard and were very much in fear of fire, but I could not find the courage to open the dump-valves to dump out our unneeded fuel. A morbid fear of dumping gas has always possessed me since veteran Captain Edwin Musick's tragic death in the Pacific a few years ago. [Captain Musick and his crew were killed when fuel, being dumped from the Pan American Airways Martin flying boat *Samoan Clipper*, caught fire and exploded.—Ed.] We did not dare cruise around to burn it up because of the approaching darkness; our keyed-up mental state could not have stood it either.

I continued to let down in a large, gentle circle to the left in order to keep myself on the inside of the turn. The circle required a diameter of about 12 to 15 miles as had the other turns previously. Our judgment was perfect on the turn; we were rewarded by coming out of it headed 245° right in the middle of the on-course, headed southwest toward the range station and the airport. We straightened up at 1,000 feet above the ground about five miles northeast of the airport.

Realizing how critical and dangerous this approach must be, I devoted all my attention from this point on to keeping the ship descending slowly enough to get in, yet fast enough to insure against stalling. My primary thought was to do a fast, drag-in approach low enough so that, if the plane stalled unexpectedly on the approach, we would hit the ground at a flat angle, slide to a stop, and perhaps be able to walk away from the wreckage. We crossed exactly over the cone of silence about 300 feet above the range towers at 140 m.p.h. From this point on I started reducing power and continued letting down for the final two miles to the field.

Then, just when we had everything squared-away to where it appeared to be right, the plane almost got away from us only a mile from the field. Nearing the ground we struck some turbulent air which caused the left wing to drop considerably. By applying heavy right rudder to bring it up, we recovered, but this action turned the ship away from the runway about 40° to the right. I slacked off the power, and it turned the ship back to the exact heading of the landing strip.

I reduced the power further, cut the ignition switches as we neared the field, and ordered Lieutenant Smith to cut the master radio switch. I called for full flaps, but they failed to go down, probably because of our speed. We went across the boundary at 120 m.p.h. about 15 feet high and, after getting the ship level near the ground, I simply held it off until it stalled and settled on. The air speed indicated 95 m.p.h. when we settled onto the ground in a three-point position, within 600 feet after having crossed the fence. The landing was very smooth and we did not even feel the propellers hit. With the brakes full on and the props plowing up the ground, we rolled straight ahead for 1,800 feet on the belly, finally coming to a rest in the middle of the runway with about 500 feet of airport remaining. [The retracted landing gear of a DC-3 projects from the engine nacelles enough so that the wheels roll on the ground in a belly landing.—Ed.] A southwest landing at Pulaski is steeply downhill, and this un-

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doubtedly contributed to our long roll.

The plane had hardly stopped rolling before Lieutenant Parker dashed back, opened the cabin door and leaped out, closely followed by Lieutenant Smith. Only taking time to close the fuel valves and with a prayer of gratitude on my lips, I quickly followed the two lieutenants out of the plane. We walked all around the airplane in a daze, scarcely daring to believe we were safely back on the ground. The feeling was indescribable.

A swarm of people charged down the field, but we waved them off, not permitting anyone to get near the airplane. It would not have required more than a dozen souvenir hunters to have torn the loose wreckage off the wings, and we did not want a single detail of the damage altered. We were fortunate in being able immediately to post armed guards from the New River Ordnance Plant to watch the plane. Then we started examining it very carefully from nose to tail.

One could have only a feeling of awed reverence for the superb construction of the DC-3 after looking at this half-wrecked specimen. How it flew at all after sustaining such extensive damage will remain one of the mysteries of their lives to everybody who examined it.

With 15 feet of wing broken off, both ailerons totaling 48 feet in length and ranging in width from one and one-half feet to three feet torn out and blown away, and deep ripples in the skin and structure of the remaining wing stubs and horizontal stabilizer, I do not see how the airplane ever remained in the air for 55 minutes while we tried to figure out how to land it.

My only criticism of the DC-3 design is that the hinge on the outboard end of the aileron is attached to the wing tip. The ailerons probably failed because of being jerked outward and upward by the wing tip when it folded up and broke off. Some way should be devised to prevent loss of the entire aileron in case of wing tip failure—the loss of 15 feet of wing is negligible when compared with the grave loss of the ailerons.

There probably are still a few pilots who think it safe to dive these ships to indicated air speeds above 240 m.p.h. Prior to this accident, I had seen DC-3's without load dived to over 250 m.p.h. with rather abrupt pull-outs at the bottom, without damage resulting. But to anybody who still cares to manhandle an airplane in a manner for which it was not designed, let me offer this bit of advice: *Be sure the plane is light and don't hit any turbulent air.*

These old timers with whom I flew as co-pilot know what they are doing when they throttle back in rough air and sometimes lower the gear to increase the drag.

I have learned my lesson and I hope future lessons do not come with such emphasis or at such high cost. My faith in modern transport aircraft has not been lowered by this incident, but I am convinced now that they never should be loaded to such high gross weights as some people think safe. [There is a proposal before the Civil Aeronautics Board that the licensed gross weight of the DC-3 be increased to 26,000 pounds. The Air Line Pilots' Association is strongly opposed to this move.—Ed.] I don't believe I would be alive today if my plane had weighed 26,000 lbs. Accidents like this make one think that some of our departed million-milers might still be around today if their aircraft had not been so heavily loaded. It's a thought that is hard to disguise. END

The Pathfinders

(*Continued from page 26*)

Since the night of November 18, Pathfinders have been laying a trail of flares accurately, and usually through ten-tenths cloud, on the heart of Berlin itself. More than 1,000,000 Germans and many squadrons of their aircraft are held in the west to protect the Nazi industrial machine against the growing weight of Allied air attack.

At this writing about half of Germany's most vital industrial targets have been knocked out of the war for a long time. The effect of Allied bombing has been evident on the Russian front where ground forces have been hampered by the lack of much essential equipment and the Luftwaffe has been unable to challenge the Red air force's superiority.

The RAF considers the indiscriminate bombing of London by the Luftwaffe in the past few months as evidence that the Germans still do not possess precise navigational methods for night attacks comparable to those employed by the Pathfinders.

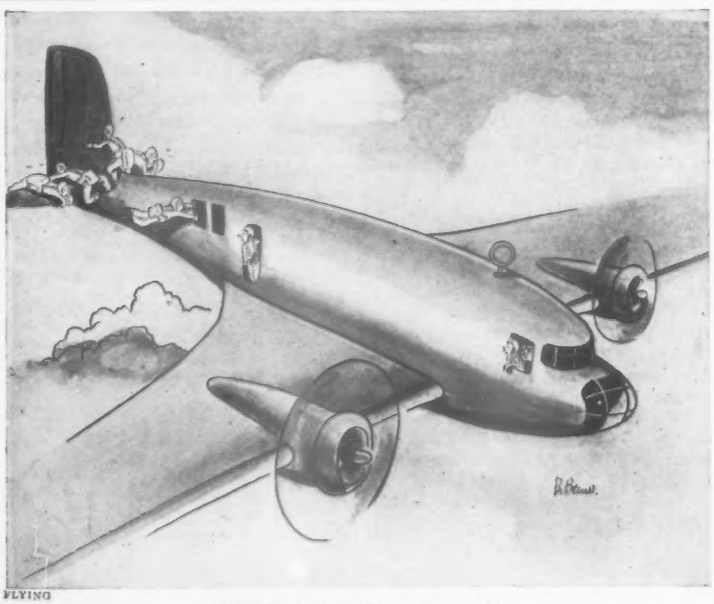
The Nazi raids are carried on by a varied assortment of single- and twin-engined planes carrying relatively light loads and flying with the wind at heights of from 3,000 to 20,000 feet. They approach the target area from whichever direction the wind is blowing to increase their speeds. Most of the planes fly in irregular formation with apparent disregard for accuracy, and drop their bombs at varying heights.

As in the 1940-41 night raids on Britain, the German raiders rely for illumination on ground fires ignited by a group of expert flyers whose main task, somewhat similar to that of the Pathfinders, is to establish the targets for the less experienced bombardiers. They have occasionally used parachute-controlled magnesium flares but these have not proved completely satisfactory and it is evident that the Luftwaffe prefers to raid on moonlit nights.

The highly-developed RAF Pathfinder methods, on the other hand, are vastly superior and more flexible. They are also adaptable to other applications. The United States Army Air Forces also has successfuly employed a similar technique for bombing through clouds in daytime. This permits a larger number of daylight sorties over cloudy northern Europe.

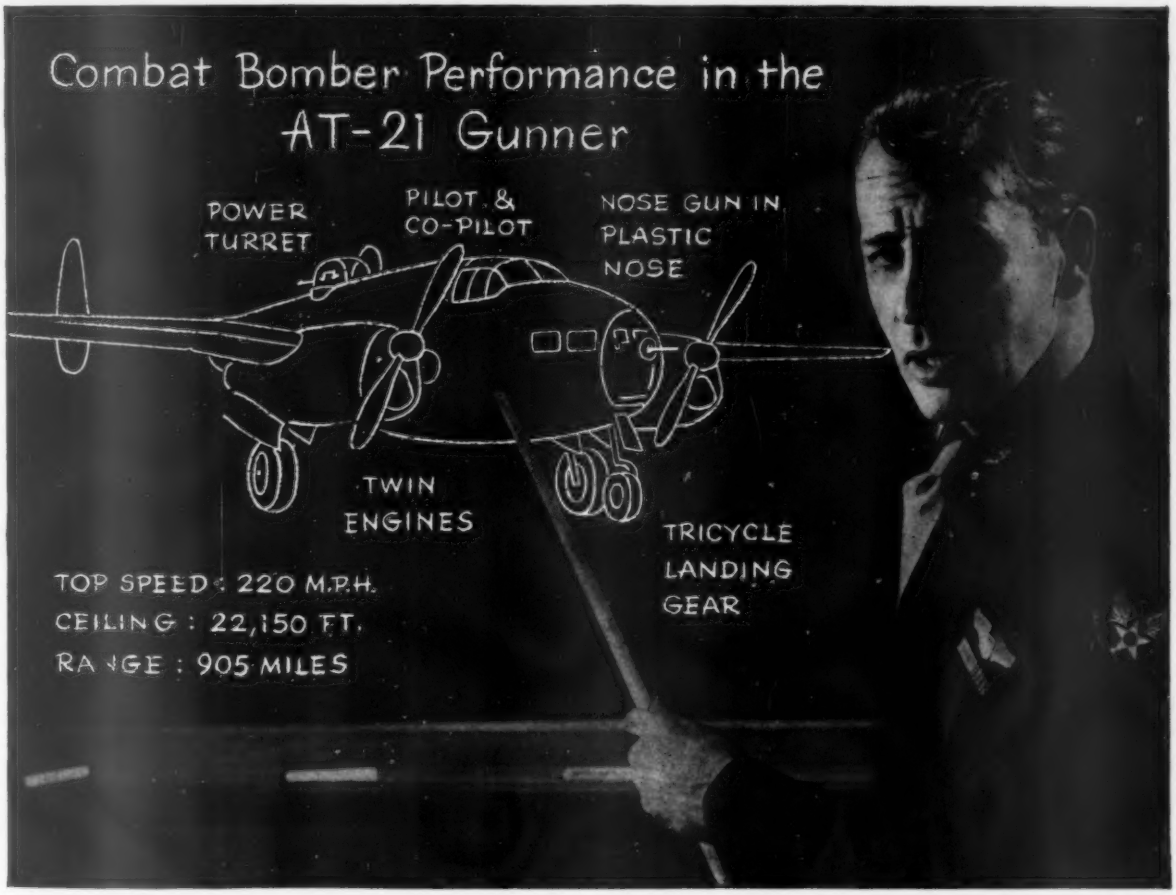
Despite all the advances made, however, neither the AAF on cloudy days nor Pathfinder-led RAF bombers at night are able to attack the small precise objectives which are so successfully hit by AAF precision bombing on clear days. Pathfinder tactics at present must be assigned to the reduction of large, built-up areas for strategic rather than tactical purposes.

While such area bombing may eventually be put to tactical uses it is not yet so employed. Nonetheless, Pathfinder techniques are so far advanced that total darkness and ten-tenths cloud cover can no longer offer much consolation to the enemy. END



"They've all lost their nerve again!"

POINTERS ON PLANES . . . . . *No. 5 of a Series*



Classroom for Combat

The feel of the fight is built into the Fairchild "Gunner"—an aerial classroom for combat equipped much like those planes that will fly in the assaults on Tokyo.

Fairchild engineers are expert in designing aircraft to do specific jobs well. So, when the Army foresaw the need for a plane with bomber characteristics to train its sharpshooters of the air, Fairchild built the "Gunner." The men who will ultimately loose "squirts" of death into enemy pursuits and interceptors, today can sharpen their skill in a plane that gives them the *feel* of combat operations.

The "Gunner" has twin guns that fire from a power-operated top turret. Its transparent plastic nose houses a manually operated machine gun. Its "office" has controls for pilot and co-pilot. And in landings and takeoffs, the "Gunner" rolls, like the heavies, on a retractable, tricycle landing gear.

With its two 520 horsepower Ranger V-Twelves for power; with its sleek rivetless surfaces of plastic-bonded plywood fabricated by the famed Duramold process; with the aerodynamic stability inherent in all Fairchild designs, the "Gunner" flies with the Fairchild "touch of tomorrow in the planes of today."

BUY U. S. WAR BONDS AND STAMPS

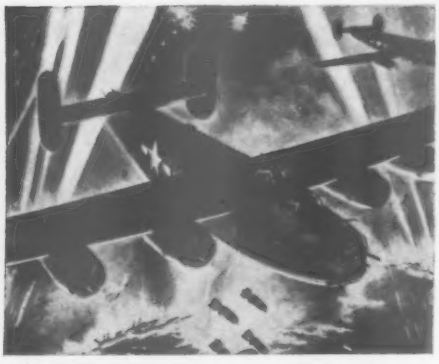
Fairchild Aircraft

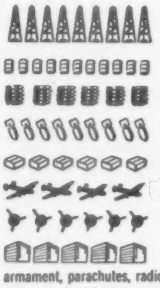
Division of Fairchild Engine & Airplane Corporation, Hagerstown, Maryland....Burlington, North Carolina

This advertisement is one of a series which is appearing in national magazines and newspapers as Consolidated Vultee's contribution toward a clearer public understanding of transportation's role in the war, and its postwar opportunities and responsibilities.

As a Liberator pilot put it:

"One of their cities is missing!"





1,600,000 gal. gasoline

60,000 gal. oil

3,250,000 rounds machine gun ammunition

4000 tons bombs

300 tons food

46 complete bombers lost

426 bomber engine replacements

75 tons other replacements: tires, armament, parachutes, radios, wing sections, instruments, oxygen tanks, bomb sights, etc.

(The figures given above are approximate)

1. 40 minutes ago, there were Nazi factories down there building Focke-Wulf 190's and machine guns. Now there are no factories. Not even a city. For the last of 1000 Allied bombers has just dropped its block busters and is heading for home.

Back of this 1000-bomber sweep is a story not many people know—a story quite apart from that of the heroism and sacrifice of the bomber crews. It has to do with the terrific problem of supply in waging aerial warfare. For example...

2. Above, you get a rough idea of the cost, *in material alone,* to send 1000 4-engine bombers over Germany. How can Bomber Command get *another* 300 tons of food...*1 day's supply for the 150,000 men it takes to put 1000 bombers over the target?* Another 160 tank cars of aviation gasoline? Another 4000 tons of bombs? Not just for tomorrow, but for the next day, and the next. *Answer:* That's where Air Power's three teammates come into the picture—the train, truck, and ship . . .

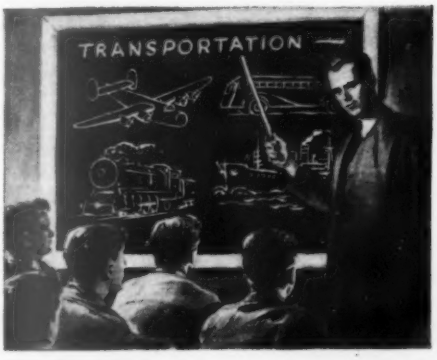
3. If your sleeper is shunted to a siding, remember this: It is probably being held up to let a fast freight streak through — tank cars of gasoline, cars loaded with spare bomber parts, engines, crates of nested bombs, tons of food, ammunition, and all the rest. Getting Bomber Command's supplies from factory to seaboard is the first lap in a 1000-bomber attack on Germany. And in this relay race to Victory, the railroads of America are doing a magnificent job!

4. Slogging along at a snail's pace, protected by anti-submarine Liberators, a never-ending convoy of cargo ships and tankers becomes the life stream of Air Power. They bridge the Atlantic with supplies and replacements to *keep* the bombers fanning out over Germany. This link in the chain of supply must never be broken. If a cargo is sunk on the way over, Air Service Command and the Navy move heaven and earth to get an exact duplicate cargo loaded into another ship and on its way within 48 hours!

CONSOLIDATED VULTEE

5. **The truck,** wherever you find it, is Bomber Command's most versatile workhorse. In the U.S., along with the railroads, it delivers the goods to the convoys. At the hundreds of British air bases from which the 1000 bombers took off, again it is the truck that lugs in the gas, bombs, food, spare parts, and so on. And as a final gesture, the truck gasses-up the heavy sluggers before they take off on their mission.

IN THIS DRAMA of train, ship, truck, and plane pitching in together to help speed the defeat of the Axis, there is a lesson *we must not forget* when the war is over:



6. **Out of this war** will come *improved, cheaper,* and *swifter* ways of transporting goods and people—over highway and rail, on the sea, and through the air. In rebuilding the peacetime world, *all these forms of transportation must work together,* each doing the job for which it is best fitted.

And the plane will have still *another* responsibility. Having linked once-remote nations together into a 60-hour-wide world, it can play a vital role in *enforcing* global peace.

In short, a postwar aerial police force is America's best assurance that the peace so dearly won will not again be violated at the whim of aggressor nations.

QUICK FACTS FOR AIR-MINDED READERS:

Without war paint — Covering the gleaming aluminum surface of a Liberator bomber with camouflage paint adds 180 lbs. to its weight, cuts down air speed about 8 m.p.h. *Recent AAF decision:* No more camouflage on combat planes. Speed, plus added armament, provides greater protection to combat crews.

• • •

And more in '44! Aircraft production figures for '43 show that Consolidated Vultee is now the world's largest producer of airplanes. The company delivered more than 126,000,000 pounds of aircraft last year, including spare parts. This represented 12% by *number* and 16% by *weight* of all aircraft built in the U. S.

• • •

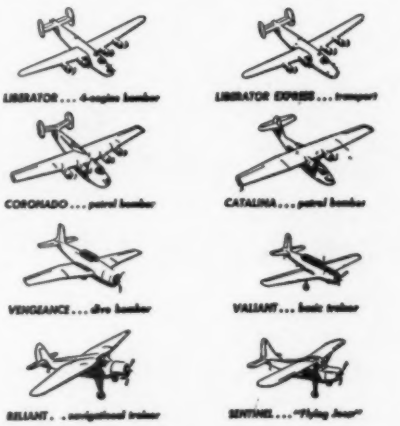
What does it cost to fly? In 1927, air transport passengers paid 13¢ a mile. Today it costs only about 5¢ a mile to travel by air.

• • •

14 to 1—Before the war it required the equivalent of 1 year's labor for 100 Consolidated Vultee workers to build one Liberator Bomber. In 1941—a year's labor for 35 workers. In 1942—for 12 workers. Last year, and today—7 workers, or less. In other words, the same amount of direct labor that was formerly required to build one Liberator now builds 14.

No spot on earth is more than 60 hours' flying time from your local airport

From "Flying Jeeps" to Leviathans of the air—*Consolidated Vultee Aircraft Corporation now builds many types of war planes, from small trainers to long-range bombers. When peace comes, the company will be in a position to provide the postwar equivalent of such planes, from small, privately owned "air flivvers" to huge transoceanic cargo-and-passenger planes.*


LIBERATOR ... 4-engine bomber
LIBERATOR EXPRESS ... transport
CORONADO ... patrol bomber
CATALINA ... patrol bomber
VENGEANCE ... dive bomber
VALIANT ... basic trainer
RELIANT . . navigational trainer
SENTINEL ... "Flying Jeep"

AIRCRAFT

San Diego, Calif. Vultee Field, Calif. Tucson, Ariz. Fort Worth, Texas New Orleans, La. Nashville, Tenn. Louisville, Ky. Wayne, Mich. Dearborn, Mich. Allentown, Pa. Elizabeth City, N. C. Miami, Fla.

Member, Aircraft War Production Council

Our Firepower Developments

(*Continued from page 58*)

shaft of a Hisso engine in a *Spad*. It proved effective against aircraft and balloons. Leak-proof gasoline tanks and armor plate came too late for practical application in the war.

Records of these actions were shelved in War Department files until preparation for the current war brought them out again. Although aircraft were faster and more maneuverable when war came to the world in September, 1939, it caught American warplanes with their flaps down. Armament had not kept pace.

The few fighting planes that we had at that time were woefully lacking in firepower. Some of our fighter types had only one .30-caliber gun and one .50-caliber gun mounted side by side, firing through the propeller. These ships became obsolete overnight when World War II ushered in the era of the "flying gun platform." We had powerful bombers and speedy fighters in the works, however.

Creating this heavy firepower and at the same time adapting idea changes from the operational theaters is the job of the Materiel Command's Engineering Division Armament Laboratory at Wright Field.

War greatly accelerated the laboratory's task. Once a small, three-room office buried in the midst of hangars and shops at Wright Field, this laboratory was fed millions of dollars for experimental purposes and expanded into the largest aeronautical armament research center in the world.

Aircraft fire control is a new art. This war's trend toward a battlefield in the stratosphere has spawned heretofore untried types of aircraft armament. One solution is the use of remote fire control systems which remove the gunner from the proximity of his guns, diminishing the effects of vibration on the sighting operation and allowing the gunner greater comfort and less fatigue.

Paralleling the development of these remote control systems, high priority is being given to heavier-caliber guns and cannon for such installations.

Great advancement has been made in applying heavy-caliber cannon for fighter offensive use and as defensive installations in bombers. Much stress has been placed on power-driven turrets for all sizes of machine guns and cannon. Such installations include locally-operated, remotely-controlled and power-boosted hand-held mounts. The latter are vast improvements over original single hand-held flexible guns and enable the larger-caliber, multiple weapons to be more accurately controlled and sighted free from slipstream effect encountered at high speeds. These installations and their continued improvement have done a great deal toward commanding respect from enemy fighters.

For example, just after Pearl Harbor, the Japs found *Fortresses* without tail guns easy prey and accounted for several of the bombers by rear attacks. Two .50-caliber guns were installed in the *Fortress* tail and on one particular flight (the first time the new guns were used in combat), the tail gunner of one *Fortress* shot down seven Jap fighter planes.

These early installations have been improved so that today tail gunners have more firepower and, in some cases, turrets have replaced the flexible guns. This increases effectiveness since turret fire is more accurate than the hand-held gun with its excessive vibration.

Machine guns fire from 600 to 1,200 rounds of ammunition per minute, depending upon the type of gun, caliber, temperature, synchronization and the design and location of all accessories such as feed chutes, ammunition boxes and means of ejection. However, rate of fire must not be over-emphasized. Guns are rarely fired in long bursts. In air combat a pilot seldom holds his trigger for bursts that exceed 25 rounds. If fire duration is exceeded, guns will become overheated and unintentional firing, damaged barrels and other serious malfunctions will result.

What constitutes adequate firepower for modern aircraft frequently becomes the object of discussion among those not familiar with this all-important factor in air warfare. The mere presence of numbers of guns or cannon, irrespective of caliber, is not indicative of true firepower. Each airplane must necessarily be treated separately during its initial design when every conceivable consideration is given to the number of weapons, their caliber and, above all, their placement in the aircraft to assure maximum protection.

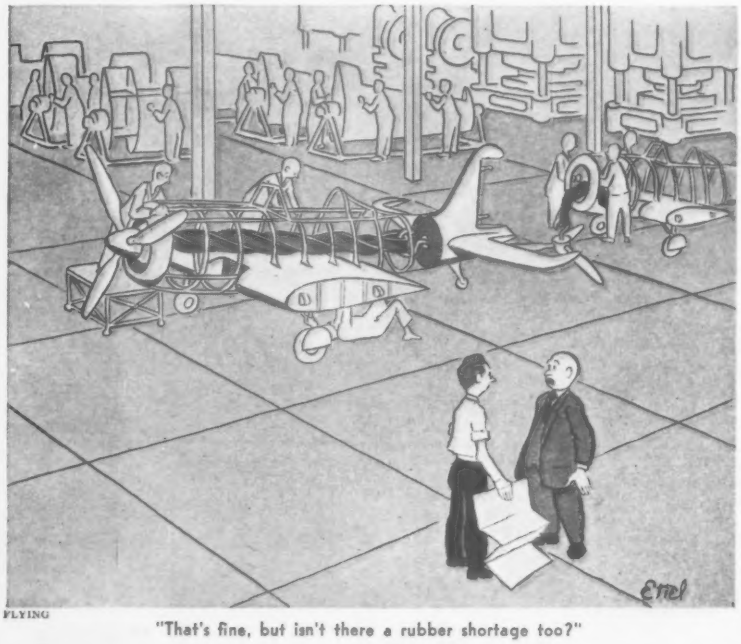
We have been fortunate in having a wide range in aircraft weapon sizes—from the small .30-caliber machine gun, capable of firing 1,200 rounds per minute and weighing less than 25 pounds, to the larger cannon which fires at a much slower rate. However, American firepower today is relying on the .50-caliber machine gun. It is the weapon most commonly employed in our aircraft.

This gun, hailed as the finest arm of its kind in the world, weighs approximately 65 pounds and is capable of firing 800 rounds per minute. Relatively small in size, it fits easily into all our aircraft types. The projectile leaving the muzzle at a speed of over 2,900 feet per second can penetrate any kind and all parts of an airplane. And the shell is small enough for as many as 1,000 rounds per gun to be carried. During one test the .50-caliber was fired at an obsolete bomber fuselage. It smashed the bomber's skin, ammunition boxes, a longeron, a hard pine board and then pierced a 7/16-inch piece of armor plate.

The .50-caliber gun has an effective range of four miles and from that distance still packs sufficient wallop to kill a man. Another measure of its force can be brought out when it is estimated that bullets from the eight guns on a Republic *Thunderbolt* firing together deliver to an enemy target more horsepower punch than the 2,000-h.p. engine which pulls the ship through the air.

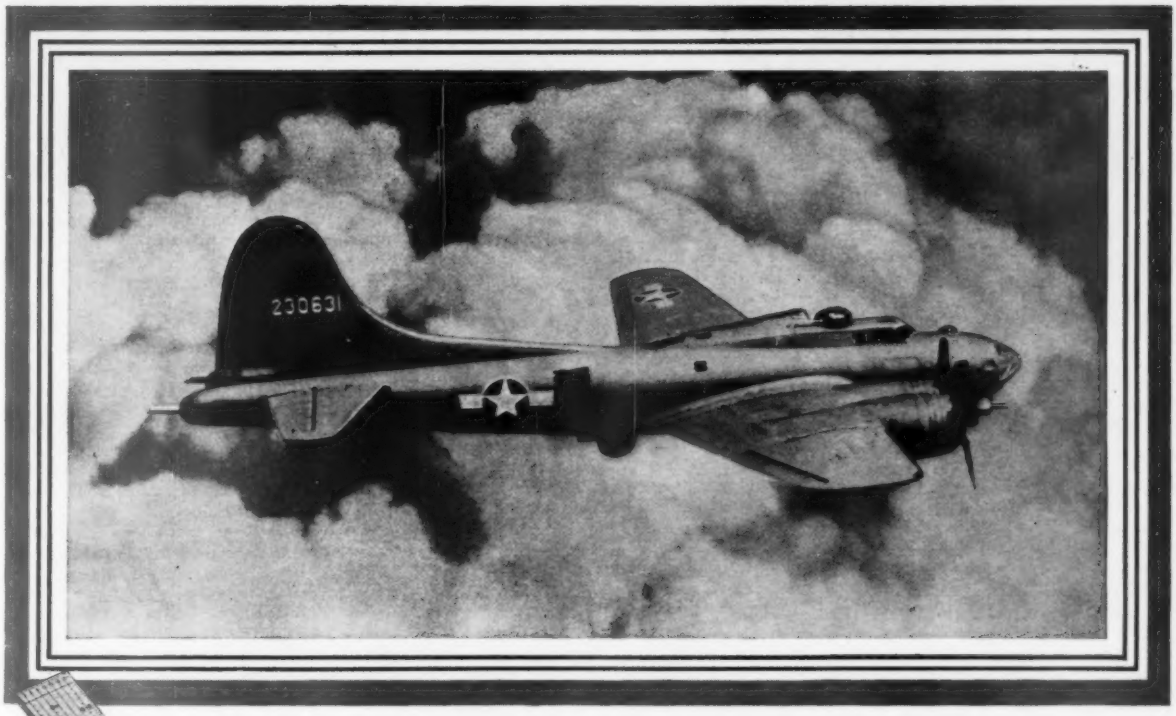
The number of guns carried in an airplane depends largely on the plane's configuration. In bomber types the guns usually are mounted in pairs which are disposed from nose to tail to afford protection from every conceivable direction of attack. In fighter types the number of guns varies from four to eight.

By comparison, a flight of 13 Republic *Thunderbolts*, each with eight .50-caliber guns, has three times the striking power



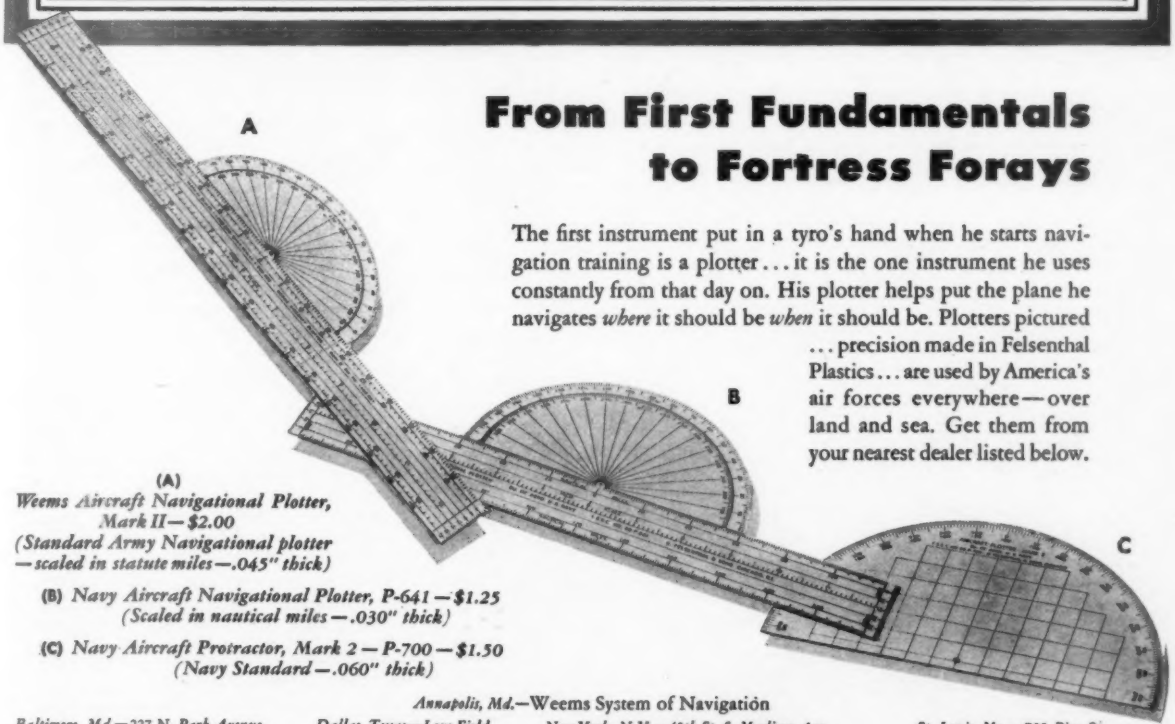
FLYING

"That's fine, but isn't there a rubber shortage too?"



From First Fundamentals to Fortress Forays

The first instrument put in a tyro's hand when he starts navigation training is a plotter... it is the one instrument he uses constantly from that day on. His plotter helps put the plane he navigates *where* it should be *when* it should be. Plotters pictured ... precision made in Felsenthal Plastics... are used by America's air forces everywhere — over land and sea. Get them from your nearest dealer listed below.



(A) *Weems Aircraft Navigational Plotter, Mark II — $2.00 (Standard Army Navigational plotter — scaled in statute miles — .045" thick)*

(B) *Navy Aircraft Navigational Plotter, P-641 — $1.25 (Scaled in nautical miles — .030" thick)*

(C) *Navy Aircraft Protractor, Mark 2 — P-700 — $1.50 (Navy Standard — .060" thick)*

Annapolis, Md.—Weems System of Navigation

Baltimore, Md.—227 N. Park Avenue
F. Weber Co.

Boston Mass.—90 State St.
Kelvin & Wilfrid O. White Co.

Chicago, Ill.—9 No. Wabash Ave.
Von Lengerke & Antoine

Elmwood Park 35, Ill.—2140 N. 77th Ave.
H. P. Reinke Associates

Dallas, Texas—Love Field
Air Associates

Houston, Texas—2510 Oakdale St.
A. M. Carrow

Miami, Fla.—139 S. Miami Ave.
Hopkins-Carter Hdwe. Co.

Mobile, Ala.—106 St. Michael St.
The Powers Company

New York, N.Y.—45th St. & Madison Ave.
Abercrombie & Fitch

North Hollywood, Calif.—12021 Ventura Blvd.
Pan-American Navigation Service

Philadelphia, Pa.—1621 Chestnut St.
F. Weber Co.

Portland, Ore.—334 S. W. Fifth Ave.
Portland Instrument Co.

St. Louis, Mo.—705 Pine St.
F. Weber Co.

San Francisco, Calif.—110 Congo St.
Miss Mary Tornich

Seattle, Wash.—1413 25th Ave. N.
Creighton Merrell Aviation Grd. School

Wichita, Kan.—1121 E. Douglas
A. Owen Holliday Co.

Precision made in

FELSENTHAL PLASTICS

G. FELSENTHAL & SONS, 4100 WEST GRAND AVENUE, CHICAGO 51, U. S. A.

of a machine gun unit of a German infantry regiment. A formation of 13 bombers, carrying a new heavy cannon now going on some of the medium types, carries twice the firepower of the 75-mm. Howitzer used by the Nazi regiment. A single flight of 13 *Airacobras*, carrying 37-mm. cannon, is equal to the anti-tank guns of the regiment.

Downing an airplane with gun fire is not simple; it is difficult to keep a fast-moving target in range. A gunner must fire more rounds in a given time interval to assure a hit on a speeding airplane. In one sense the perfection of the machinery used by the gunner can be considered a measure of his firepower. If the gunner could be assured a hit each time he squeezed the trigger, obviously one gun would be adequate. However, because of the complications involved—the ballistic behavior induced when a projectile is fired from an airplane, the human element, and the speed and maneuverability of the airplane target—aerial gunnery is a complicated procedure.

Our bombers for some time have been using computing sights which have forced enemy fighters to remain at a range from which their firepower is ineffective. These computing sights are being improved continually. The problems involved in correcting completely for aircraft gun-laying are many and, to obtain hits, they must be solved to a fine degree of accuracy. These solutions include accurate and instantaneous computation of and correction for lead and ballistic variations caused by altitude, range and speed of the firing airplanes. In fact the corrections obtained through use of computers parallel those of the secret bombsight but actually involve a greater number of factors which must be solved with even less assistance from the gunner.

In the last war the ordinary ring and bead sight was standard for all aircraft guns. Now the ring and bead sight is used only on hand-held guns. Reflector sights eliminate the need for lining up the gunner's eye and front and rear sights with the target since the sight itself actually projects a sight reticle image onto a transparent reflector plate which, at infinity, moves with the gunner's eye. Thus, although the gunner's head may be in continual movement due to the passage of the plane through rough air, the sight line and target remain together.

Although the use of computing sights thus far has been limited to turrets, additional computing sights have been developed and placed in production for use in all other gun positions. A large amount of credit is due the various fire control system manufacturers for their research and development.

The gunsight aiming-point camera is proving highly beneficial in improving the accuracy of our gunners. A small compact camera, carrying 16-mm. motion picture film in its magazine, it is mounted behind the gunsight and takes a picture of the sight reticle as it is projected on the target. Thus it is possible to study exactly what the gunner has seen through the gunsight and make evaluations and corrections to improve his aim. Quick-processing film enables this study to be made a few minutes after the gunnery practice — or actual air combat — since some of the cameras have already been employed in battle areas. While the gunner's errors are still fresh in his mind he can see what should have been done to improve his effectiveness.

Recently, instructors at a gunnery school revealed that before using the gun camera their students scored 22.4 per cent hits in ground gunnery and 4.7 per cent hits in aerial gunnery, but after they had used the camera and studied their faults, the hit percentage was jumped to 27.5 per cent for ground gunnery and 43.5 per cent for aerial gunnery. Later, in trying for gunnery records, those trained on the gun camera scored 58.75 per cent on ground gunnery and 59.5 per cent for aerial gunnery. Thirty per cent of gunners have been rated as experts after being trained in use of this camera.

Two main factors in aerial gunnery determine the accuracy of gun fire following automatic computation—*tracking* and *ranging*. Unless the gunner tracks smoothly and ranges precisely, the computing gunsight will be given inaccurate data on which to base its calculation. Tracking involves keeping the gunsight precisely on the target without deviation, while ranging refers to manipulation of the sight's range-measuring mechanism to keep the correct range constantly in the computer. Both are done in turrets by wrist or feet movements.

Advancements in aircraft armament over the past four years have necessitated the development of new armament testing facilities including indoor and outdoor firing ranges, cold rooms for test firing at extremely frigid temperatures, high altitude pressure chambers, sight and computer testing devices and advanced electronic tests. Because our aircraft are fighting in extremely high desert temperatures and extremely low arctic temperatures, it has been necessary to design armament equipment for perfect operation in all climatic and atmospheric conditions. The temperatures under which armament items are tested range from −60° to 160°. A recently completed cold test firing room at the Wright Field armament laboratory is proving invaluable in the investigation and testing of all equipment. In the high altitude pressurized chambers, strange phenomena of aircraft armament operation are being investigated continually.

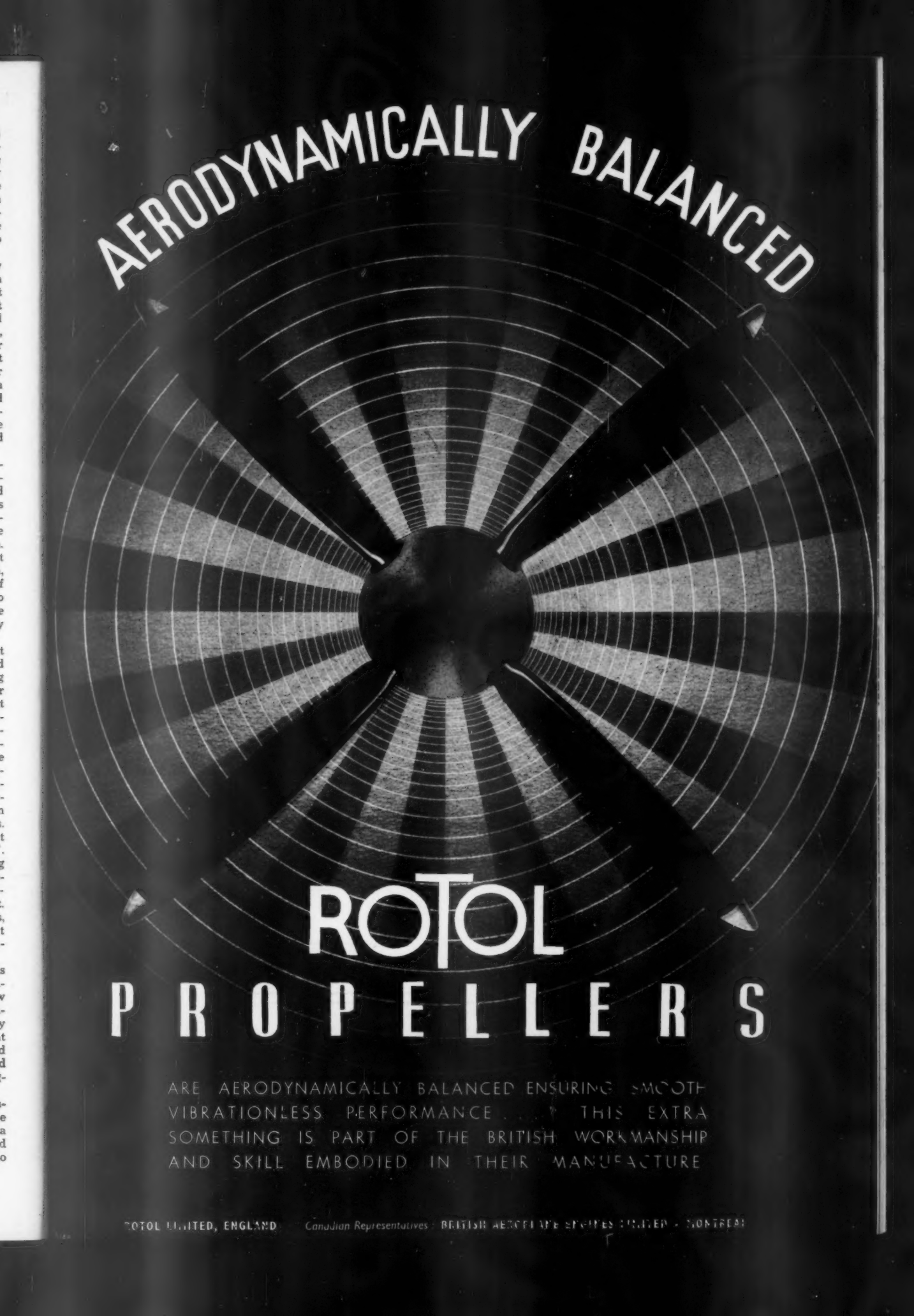
From studies of the reaction of guns and their firing mechanisms to cold conditions, researchers have developed new greases and oils that allow smooth operation of guns at any temperature. They also have studied effects of cold and heat on the thick glass transparencies around windshields and turret installations and developed new types to offset the damaging temperatures.

In another section of the large laboratory is a "torture test" chamber where guns are fired on life tests. Mounted on a large grotesque frame, machine guns and cannon are fired for as many as 8,000 to

(*Continued on page* 110)

FLYING

"Gridley, you old rascal, you've found me out!"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ROTOL
PROPELLERS
ARE AERODYNAMICALLY BALANCED ENSURING SMOOTH VIBRATIONLESS PERFORMANCE . . . THIS EXTRA SOMETHING IS PART OF THE BRITISH WORKMANSHIP AND SKILL EMBODIED IN THEIR MANUFACTURE
ROTOL LIMITED, ENGLAND
Canadian Representatives

Highlights from LAISTER-KAUFFMANN

the story of Murray Nanson Whitehead

Murray Nanson Whitehead, Vice-President of the Laister-Kauffmann Aircraft Corporation, has complete faith in the individual's importance in man's struggle to conquer the air. And from that October day when he first took over the controls of a plane he has known that he would have a part in this conquest. Through years of actual hardship he never lost this conviction. Month after month he looped and raced and dove and nearly shook the guts out of the little ship on which he developed and improved his ideas. He was going to build a plane that every man could own—or else! A small, light, inexpensively operated plane that would give every man a taste of exploring the air just as the low priced automobile had opened up the broad land of America for every man to travel.

When Murray Whitehead met Jack Laister he found that, while Laister's first interest was gliding, he, too, believed that the most important phase of man's fight to master the air was yet to come. He, too, believed that not until everyone had the opportunity to know the joy of flight would this mastery be won. Soon Jack Laister was helping him refine plans for his low cost dream plane. Blueprints, production estimates and actual "mock-up" took shape rapidly.

Meanwhile, Murray Whitehead scouted for a backer. When he found John R. Kauffmann, the Laister-Kauffmann Aircraft Corporation trio was completed. Laister, the engineer-designer; Kauffmann, the business executive who was also a mechanical engineer; and Whitehead, the visionary promoter-inventor. Here was a gang that would go places.

Then came war. The boys who would have flown Murray Whitehead's planes were on their way to Tokio, Rome and Berlin. Laister-Kauffmann was awarded an Army contract to manufacture gliders . . . Jack Laister's gliders . . . and Murray Whitehead jumped into this work with all the enthusiasm he had given his own project.

Today, as Laister-Kauffmann gliders roll off the production line ready to pass their static and flight tests with flying colors, Murray Whitehead spends his Sundays towing experimental ships to help Jack Laister check their performance. Sometimes, circling back to the field, his mind slips away from the present to that day when the boys will come back from the war eager to fly for the fun of it, eager to see the Laister-Kauffmann ships destined to serve them. He thinks of the morning he can pick up his phone and say . . . Okay, Charlie, she's ready. We'll deliver her this afternoon. And she's a honey!

Wings FOR THE FUTURE

Laister-Kauffmann Aircraft Corporation

ST. LOUIS (17) MISSOURI

Saving Lives

... is our business! In the midst of world-wide destruction it is inspiring to be in the business of life saving. Deeply grateful to be in that position, we of Standard Parachute Corp. fully appreciate the responsibility the job imposes. As man's last chance, Standard chutes must be no less than perfection in every stitch and seam. No other needlecraft assignment in all the world calls for such fine character of workmanship and precision of machines.

AFTER VICTORY

... we hope to apply our skills and adapt our machines to producing peacetime goods for your better living. To speed that day

BUY MORE WAR BONDS

Stanpar

STANDARD PARACHUTE CORPORATION SAN DIEGO, CALIFORNIA, U.S.A.

(*Continued from page* 106)

10,000 rounds a day to determine life expectancy of gun barrels and to make sure there is no malfunction in the gun mechanism.

Such tests produce innovations in gun design and installation methods. Armament engineers, with the splendid co-operation of Ordnance, have worked out the most efficient guns in existence. In one day this year patent applications for seven new inventions on a particular gun were sent to Washington from the armament laboratory.

The normal procedure in the development of new items of armament equipment involves the following steps: Requirements are laid down—usually as a result of actual combat requirements which are forwarded to the Materiel Command—and preliminary specifications drawn up by the armament laboratory. These specifications in most cases are submitted to competent fire control manufacturers who, in collaboration with engineers at Wright Field, conduct the necessary research development, design and fabrication of an experimental article. When the first model is completed, tests are made by the manufacturer prior to its release to the Materiel Command for further laboratory trials and installation in aircraft for preliminary air-firing.

Upon satisfactory completion of this testing, the model is sent to the Army Air Forces Proving Ground Command at Eglin Field where complete functional and tactical suitability tests are carried out. If the article under test meets the requirements it is recommended for standardization and procurement. This may seem a long drawn-out routine but actually it is accomplished in a relatively short time.

Conversion of the Douglas attack bomber into a night fighter was an example of meeting the demands from the front. For some time the British were using *Bostons* on intruder raids over the Continent—going over low, skirting between hills, and dropping light fragmentation bombs on German airfields and gun installations in France. But this wasn't enough. The British wanted the plane for a fighter as well. They tried different types of gun installations in the nose of the ships. We have followed suit in converting this plane, which we call the *Havoc*.

Changes in armament usually mean long, drawn-out conferences behind closed doors—hard, cold fact discussions with experts from the equipment laboratory who tell us how much electrical energy we need for new installations, how much we can get and no more. Gun engineers, crack turret trouble shooters, bomb and bombsight technicians are present. We discuss the whole idea with the men who operate our training schools, teach our bombardiers and gunners. Then, from the aircraft laboratory specialists, we learn how much airplane we can cut away for new installations; how much weight we can add here and take off there to keep the plane aero-dynamically stable Some time is spent with production division men who handle the task of getting needed materials, readying a manufacturer to build the plane we desire and seeing to it that production begins immediately.

After standardization and procurement of new armament equipment, work is continued by the manufacturer and the armament laboratory to improve the article still further.

Indicating the scope of experimental projects concurrently undergoing development and testing by armament experts, there are at present approximately 70 airplanes of different types at Wright and Eglin Fields. In some cases, upon completion of the tests by Eglin Field, the airplane and experimental armament items are flown to a combat zone for further tactical evaluation before they go into actual service. All armament development projects do not originate with tactical organizations. The initiation of a new experimental airplane in most cases calls for a parallel development program by the armament laboratory.

To illustrate how a new airplane may dictate new armament designs, it may be said that plans for the giant Douglas B-19 bomber called for unprecedented turret installations—before the British or any other country turned attention to the power-operated turret. The armament laboratory's task was to design, perfect and install these turrets in mock-ups long before the big plane took to the sky. Thus, contrary to popular belief, American designers were studying the effectiveness of mechanically controlled turrets some time before the war.

Types of armament are determined by the tactical use to be made of the airplane. For instance, in the case of a night fighter where the normal technique requires approach on the target from a certain direction, the fire control equipment must be so designed that the maximum firepower can be obtained in that direction. The sight operator's position must be located to permit maximum visibility in scanning and sighting. In the case of the night fighter, development of a sight that allows greater passage of light through the optical system may be required.

One night fighter developmental design has a multiple-gun turret. For several months we tested the turrets in special mock-ups in our laboratory before the complete airplane was brought to Wright Field. The plane's upper turret fairly bristles with guns, resembling an infantry pill box.

In the past, the main function of the armament laboratory was to develop new aircraft armament items. In addition to this development work, much of the effort of this laboratory—and of the Engineering Division—is directed toward the modification of combat equipment to replace one type of standard equipment with another type, depending on the tactical use of the aircraft. Other developments engineered by the armament laboratory may not be for specific application—but for insurance against the day they are needed. Some of our newest gadgets are put on the shelf to await the time when they can be used most effectively.

Up to the present time, armament for fighter aircraft has varied only in caliber of guns. However, with the stepped-up tempo of enemy fighter activity, the requirement for a fixed gun installation that will provide automatic corrections for lead, range, altitudes and speeds is becoming more apparent. This subject now is being investigated and development models are being tested. A great amount of development work also is being accomplished on new improved types of fighter

(*Continued on page* 114)

FLYING

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*AVIATION ENGINE

ECLIPSE "SERIES 48" INERTIA AND

DESIGN CHECK CHART FOR ECLIPSE "SERIES 48" COMBINATION INERTIA AND DIRECT-CRANKING ELECTRIC STARTERS

APPLICATION

✓ For high-speed cranking of aircraft engines in the 1200-2500 hp. class—with reserve for larger engines that may become available, up to 3000 hp.

✓ "Series 48" Starters provide four methods of cranking to meet all contingencies:

1. **Combination inertia and direct cranking for normal operation**
2. **Direct cranking alone for warm engine starting**
3. **Inertia cranking alone when batteries are low**
4. **Hand cranking for emergencies**

PERFORMANCE

✓ With nominal engine cranking torque of 400 lb. ft.—initial cranking speed 115 r.p.m., followed by direct cranking at 60 r.p.m.

✓ Flywheel at normal speed (24,000 r.p.m.) stores nearly 16,000 ft. lbs. of energy—sufficient to insure starting under all temperature conditions.

DESIGN FEATURES

✓ One-wire, 24-volt DC operation. Available for either clockwise or counterclockwise rotation, with 3- or 12-tooth jaws.

✓ High-speed, heavy-duty, electric motor for direct cranking.

✓ Built-in meshing solenoid for automatic control of starter jaw engagement.

✓ Pre-set, friction disc, overload clutch (sealed against entrance of engine oil) to protect starter from undue loading or engine backfire.

✓ Concentric design. Dimensions: 6⅝" diameter, 12⅝" long from mounting flange to back head. Weight: 42½ lbs. with 6" flange; 43½ lbs. with 7" flange.

★ Since 1917, Eclipse has pioneered in the development of aviation engine starting systems for all types of service. In addition to combination inertia and direct-cranking electric starters, Eclipse also makes direct-cranking electric starters, cartridge-type combustion starters, hand inertia starters, and hand turning gears. Full details on any of these starting systems will be sent upon request.

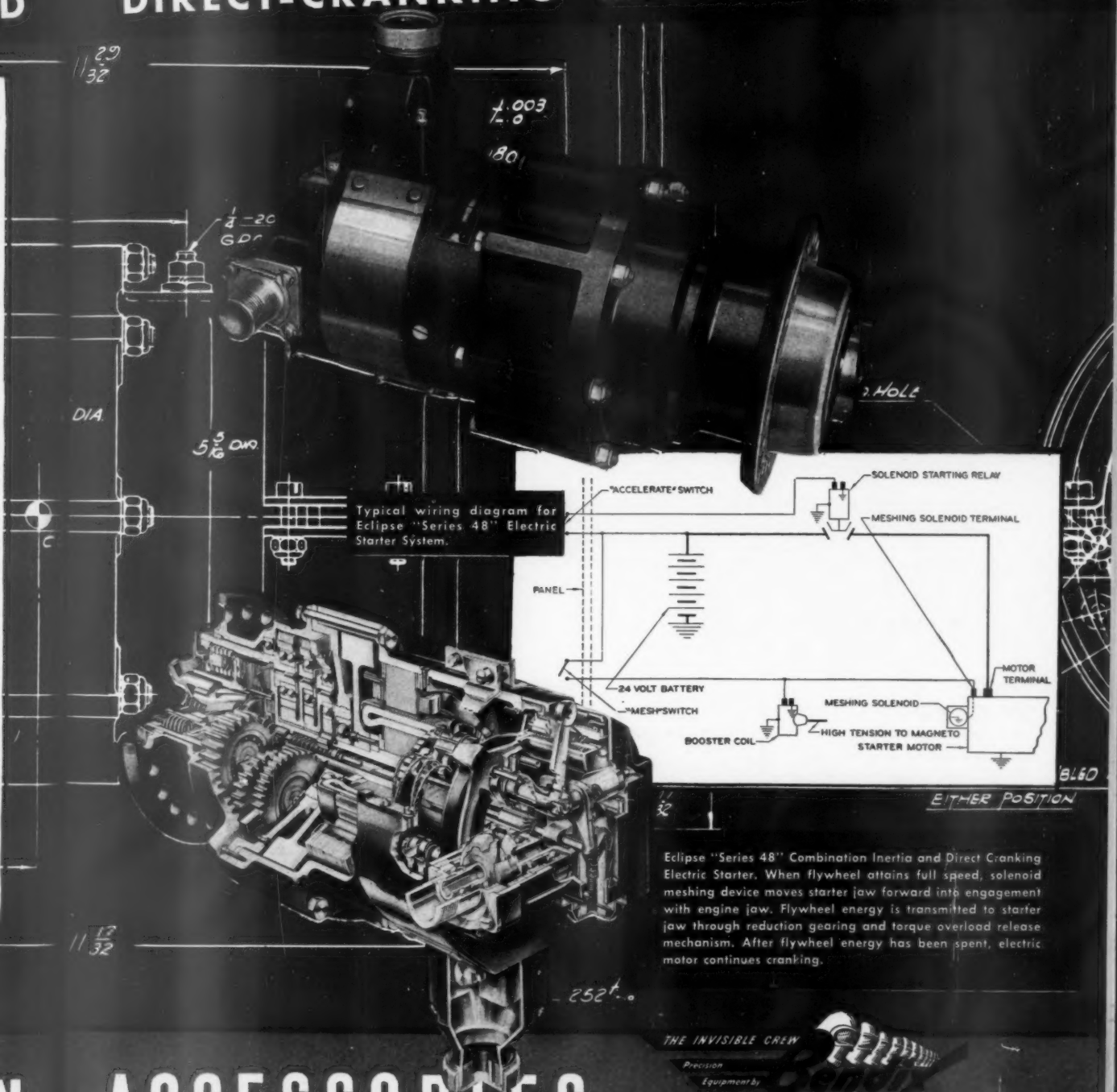
"Eclipse" is a Trade Mark of Bendix Aviation Corporation

Eclipse AVIATION

ECLIPSE-PIONEER DIVISION

STARTING SYSTEMS

DIRECT-CRANKING ELECTRIC STARTERS



Typical wiring diagram for Eclipse "Series 48" Electric Starter System.

EITHER POSITION

Eclipse "Series 48" Combination Inertia and Direct Cranking Electric Starter. When flywheel attains full speed, solenoid meshing device moves starter jaw forward into engagement with engine jaw. Flywheel energy is transmitted to starter jaw through reduction gearing and torque overload release mechanism. After flywheel energy has been spent, electric motor continues cranking.

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ACCESSORIES

Teterboro, New Jersey

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Chief Timer, National Aeronautic Assn.

Foreword by Capt. Eddie Rickenbacker

THE complete story of the evolution of aviation is told by an eye-witness of the world's outstanding record flights. *Special features:* First-hand accounts of the world's great flights • Chronological tables of every important development • Logs of outstanding flights • Hundreds of original photographs, never before printed. 8½" x 10¾", 200 illustrations, 400 pages. $6.00

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(*Continued from page* 110)

gunsights. These include sights for night fighting purposes, extension of present sighting ranges, combination gunsights and dive bombsights.

That the firepower job is being well done is evidenced by the tallies which our airmen are scoring in combat against the enemy, by the number of Jap and German planes falling in combat, and the ever-increasing pounding of enemy cities by our big bombing planes.

Literally, we are designing guns and putting wings on them. END

The Navy's Airline

(*Continued from page* 34)

All NATS passengers are priority passengers, largely Naval personnel. Most of them fly at least 1,200 miles per trip. Each ton of priority cargo averages about 1,300 miles per trip.

NATS transports return from overseas with cargoes of strategic material for American war industry. Among these are industrial diamonds, mica, beryl ore, rubber, quartz crystals, platinum, quinine and totaquine, block talc, and the like, without which we would be unable to manufacture radio equipment, camera lenses, precision instruments, and much medical, electrical and chemical war material.

The Air Cargo Priorities section of the War Production Board estimates that during 1943, such cargo moved six times faster and 20 times more safely than by surface carrier. Over most strategic routes, NATS aircraft have attained payload factors averaging almost 100 per cent.

NATS is currently using the following plane types:

The R3D-1 and R4D-1 which are the Army's C-47 and C-53 versions of the Douglas DC-3; the four-engined Douglas *Skymaster* (R5D), the four-engined Consolidated *Coronado* (PB2Y-3R), converted for use as a transport; the four-engined Sikorsky JRS-1, known in the Navy as the *Excalibur;* the twin-engined gull-winged Martin *Mariner* (PBM-3R) converted for transport use, the Boeing *Clipper,* the Curtiss *Commando* (R5C), the giant Martin *Mars* (JRM-1) and several miscellaneous types acquired from the airlines.

In addition, the Navy has ordered 20 more of the *Mars* type, some Consolidated *Liberator Express* transports (RY-1) and some of the new stainless steel Budd transports, the RB-125.

The *Mars* and the new Budd planes best foreshadow coming events in post-war cargo carrying.

Shortly after Pearl Harbor the Edward G. Budd Manufacturing Co., of Philadelphia, Pa., began work on the first large-sized plane of stainless steel construction and the first designed and built as a cargo carrier for the Navy.

Experimental models have been completed and have been undergoing tests. Naval authorities are enthusiastic about the plane and it should go into quantity production soon.

Much of the data on the Budd plane is secret but it is known to be powered by two Pratt & Whitney engines and is built entirely of stainless steel except for plywood doors and interior floors.

Special attention has been given to cargo handling in the development of this plane. Other such cargo planes undoubtedly will follow to add their bit toward revolutionizing transportation of supplies for war.

The *Mars* originally was designed as a "flying battleship," but since has been accepted by the Navy as a cargo carrier.

Another important development sponsored by the NATS in co-operation with the ATC and commercial airlines has been new techniques and methods of packaging airborne cargo.

According to the Navy, new packaging methods developed by NATS are saving American taxpayers more than $2,000,000,000 annually.

Since air cargo gets much more careful handling than goods that move by truck, train or ship, the Navy has substituted lighter packaging for the heavy containers in which materials usually are shipped from factories.

This makes it possible to get more of the urgently needed supplies to the fronts faster and effects telling economies in per item shipping costs.

Officers and men assigned to air terminals learn packing, marking, corrosion prevention and methods of handling at the Forest Products Laboratory, Madison, Wis. Following preliminary training, it is their duty to find means of eliminating unnecessary poundage.

Heavy wooden crates much larger than the article contained are used by manufacturers who hesitate to take the risk of having goods reach their destination in a damaged condition. This excess bulk must be eliminated. For example, eight pistons for a ship arrived at the air terminal in boxes of two-inch lumber. They were repacked in one-inch plywood boxes, saving 44 pounds each. The saving meant that urgently needed small parts for airplanes could be shipped at the same time.

Another instance concerns two aviation tires which arrived in huge crates. The tires were removed and tied together with steel bands, eliminating several hundred pounds.

It is simple arithmetic that when a plane carries 8,000 pounds and 50 per cent of the payload is made up of tare weight (weight of cargo packaging), the craft obviously is carrying only 4,000 pounds of actual cargo.

Another technique developed is the use of special mesh nets secured around cargo to keep it from shifting in the plane.

The tremendous importance of packaging is best indicated by the maiden cargo flight of the *Mars,* which on one leg of a trip to South America and back broke all records by carrying 35,000 pounds of freight.

Other records also were broken by the

(*Continued on page* 118)

TOP COVER . . .
for Attack at Dawn!

As dawn comes, lean, snarling pursuit planes roar through a lightening sky to become protective patrol above ground operations. It is "top cover" to shield the men below from air-assault, or to blast in low, screaming dives enemy installations that are blocking the advance.

The ever present, Hallicrafters-built SCR-299 Mobile Radio Communications Trucks are often the means of directing the "top cover." Operating under any conditions, these Giants of Military Radio, whether calling for "top cover" or directing the fire of artillery, "get the message through."

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HEY BUD, LISTEN TO NO. 3 REV UP!
SHE SOUNDS LIKE A NEW ENGINE

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Kinner engines power Fairchild, Meyers, Ryan and Howard training planes. Kinner will serve America and the world with all types of power plants when Peace comes.

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Complete Kinner-built cylinder assembly used in engines that power our fighting aircraft.

Buy More War Bonds

A New Weapon — The "BLACK WIDOW"

The Northrop P-61 "Black Widow" is a new warplane that will play its part in the present all-out push for victory.

As the Army's first functional night fighter, the Northrop "Black Widow" is equipped to handle the "night shift". . . to guard newly won air-strips and beachheads . . . to intrude on the enemy's own home ground and upset his plans for offense and defense . . . to destroy his planes.

The P-61 "Black Widow", product of Northrop know-how and craftsmanship, is the largest, most powerful pursuit plane in the skies. It has long range, great speed, fast climb. It is heavily armed.

This new U. S. weapon was designed in cooperation with the Army Air Forces Matériel Command by the Northrop group. In the months ahead you'll hear more about this airplane, see more of it. The deadly "Black Widow". The P-61.

NORTHROP

Designers and Builders of the

P-61 'Black Widow' NIGHT FIGHTER

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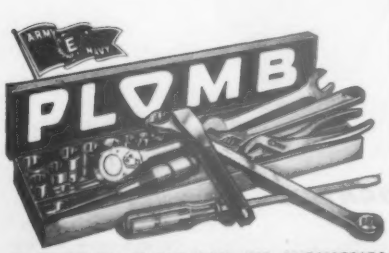
. . . for better clearance

Here's one of the many Plomb Tools that are speeding war work.

It represents the most compact line of Offset Box Wrenches on the market — covering the greatest number of opening sizes with the minimum number of wrenches — available in both long and short types.

Features like this make Plomb Tools the choice of professional mechanics in all industries. You will find the tools you need at Plomb dealers, everywhere. *Plomb Tool Co., Los Angeles 54, Calif.*



FINE HAND TOOLS FOR ALL INDUSTRIES

(*Continued from page* 114)

Mars when she took off from Patuxent River, Md., last November, and flew nonstop a distance of 4,375 miles to Natal, Brazil, carrying 13,000 pounds of Christmas mail for the armed forces.

Among the world records set by the *Mars* on the 8,792-mile round trip flight which was made in 55 hours and 31 minutes flying time were:

1. Longest overwater non-stop flight.
2. Greatest air cargo—35,000 pounds on one leg of the return journey.
3. Heaviest load ever lifted by a plane —148,500 pounds gross at take-off.
4. Longest non-stop cargo flight.

A few weeks later the *Mars* went into regular service with the NATS between San Francisco and Hawaii, a mere 2,400 miles over water. Its crew alone averages 12 to 15 men.

Despite the increasing use of land planes for over-water routes, NATS officers point out that certain specific tasks can be accomplished only through the use of flying boats.

On several of the fronts, particularly around the small atolls of the Pacific, there are no airfields that can accommodate large land transport planes, but seaplanes can land easily on lagoons.

So long as planes develop engine difficulties, seaplanes will prove valuable to move important cargo and personnel. A land plane doesn't remain on the surface more than a few seconds if forced to come down. Several months ago, however, a NATS plane converted from a four-engined Consolidated *Coronado* patrol bomber was forced down in the mid-Pacific and rode 20-foot swells for 42 hours before repairs were completed to the pitch-activating motor of a propeller. A destroyer rushed parts to the flying boat, repairs were completed under unpleasant weather conditions, and the craft took off under its own power for Pearl Harbor.

The plane was being operated for NATS by Pan American Airways and was carrying a crew of 11 and eight passengers when the incident occurred several hundred miles from Pearl Harbor.

Navy men aren't the only ones who have a high regard for flying boats. Ask army airmen who have been shot down in the Aleutians. They have nothing but praise for the lumbering Consolidated PBY's that picked them up in time to save them from freezing seas.

Perhaps some day the perfect amphibious plane will be designed and built. Until then, however, the Army and Navy will have to depend on land planes for certain missions and seaplanes for others.

Best example of the proper use of both types can be found in the NATS and its growth from a few planes and men to a world-wide organization. Flying boats will become increasingly valuable as the Navy forces the Japs out of more and more small islands in the mandated group.

Other important activities of the NATS which have been mentioned briefly are ferrying and training. The Naval Air Ferry Command at present is delivering some 3,000 planes a month to the Navy. There are three Naval Air Ferry Command squadrons, based at New York, Columbus and San Francisco. One service squadron and several service units are stationed along the domestic ferry routes. The NAFC, under command of Capt. John W. King, USN, was commissioned Dec. 1, 1943, as a wing command of NATS.

Originally the ferry groups were designed solely for delivery of new planes from contractors' plants to fleet pools on the east and west coasts. So far, all deliveries have been within the continental U. S. As the war progresses and large aircraft such as the *Liberator Express* are delivered in quantity, the Navy expects the ferry service to extend overseas. Army facilities and personnel have been used at overnight stops on these ferrying operations.

Originally it was not too difficult to obtain trained pilots, navigators, flight engineers and other technical personnel for the NATS program. At present, pilots are trained at a transitional training school at Fort Worth, Tex., operated by American Airlines and at a similar school at Roanoke, Va., operated by Pennsylvania-Central Airlines. Most of the pilots trained have previously completed a course in instrument flying at the Navy's Instrument Flight Instructors School, Atlanta, Ga. At present, Navy primary flight instructors and graduates of Navy intermediate training make up the majority of candidates trained at Atlanta for further assignment.

Prospective navigators are trained at the Naval Aerial Navigators School, Hollywood Beach, Fla. Flight engineers are trained at the Naval Training School, La Guardia Field, by Pan American Airways engineers. There are also mechanics and radiomen's schools.

The NATS is developing a blueprint that should give the United States a head-start in the anticipated post-war race for the establishment of one or more global networks of commercial airlines.

The importance attached by Congress to air transportation was indicated by the fact that Congress appropriated $40,000,000 for expansion of facilities to integrate the Naval Air Transport Service with Naval establishments which may be used in commercial aviation after the war.

Among the obvious but important benefits which the NATS will bring to post-war aviation are:

1. Good bases (except those retained for Navy use only) will be ready and waiting for commercial business along well-marked routes across the world's continents and oceans.

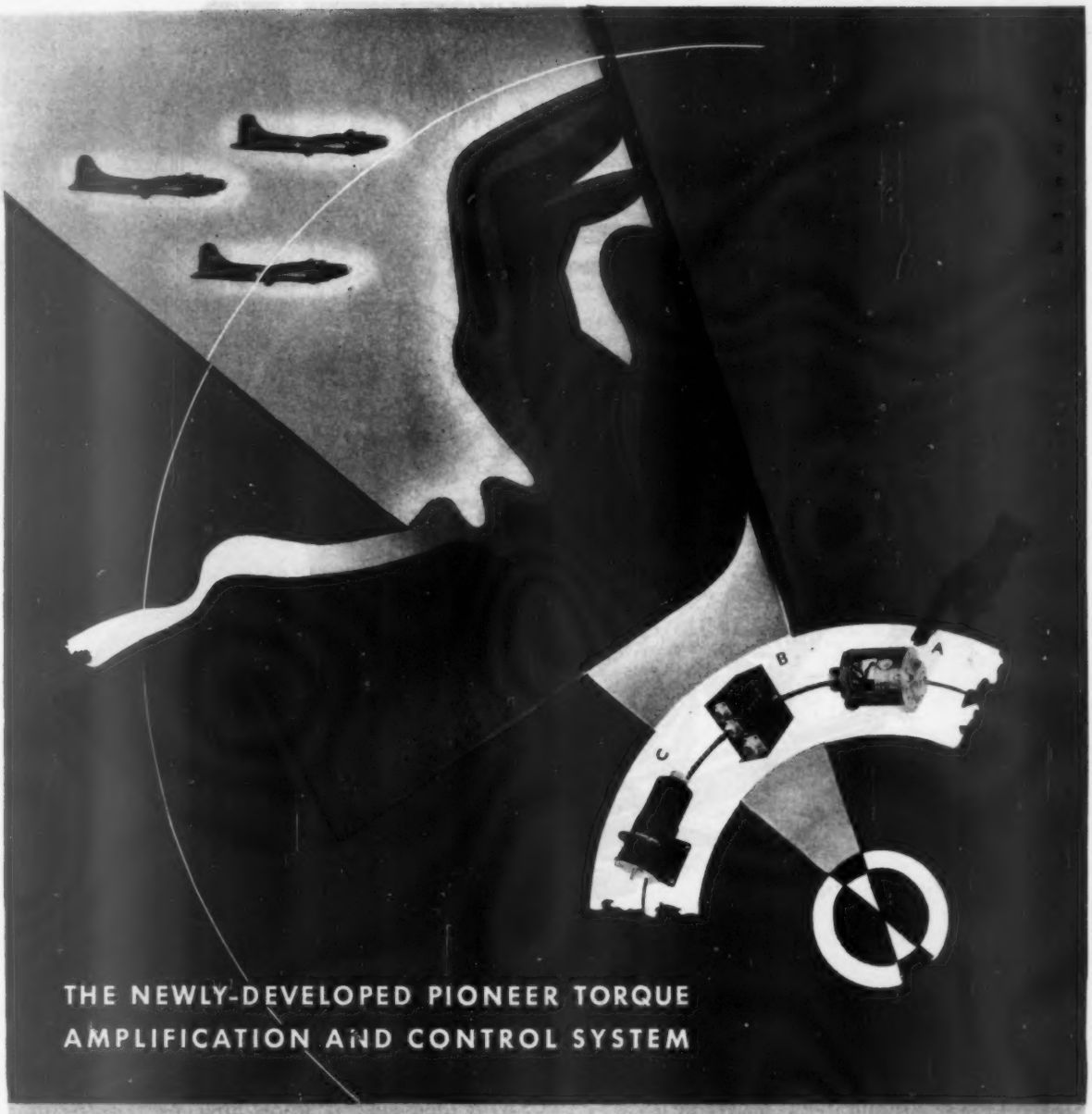
2. Aircraft factories will be geared for quick conversion to mass production of peacetime cargo and passenger planes shortly after the demand drops for combat types.

3. Improved plane designs and motors will be available in great quantities to assure the greatest load capacity for safe transfer across thousands of miles of land and water.

4. Both the Army and Navy will probably be in a position to return cargo planes to commercial firms to tide them over until aircraft plants can begin to turn out new craft.

5. Plenty of skilled pilots and navigators

(*Continued on page* 122)



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"AL SAYS he wishes he could do more in this war ... but I bet he's doing plenty where he is.

"Some guy, Al Heflin! He was my Leadman in Department 6310 back at Solar ... a regular top sergeant for getting things done even if he had to *invent* a way ... like his 'Leg-Puller,' a tool that lines up a certain airplane exhaust manifold part in his department so accurately it fits the next assembly like a glove. Saves a lot of time and 'squawks,' that 'Leg-Puller.'

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"I've got a rain-check on my old job at Solar and when I get back it will be fun to work on stainless steel again."

ARMY E NAVY

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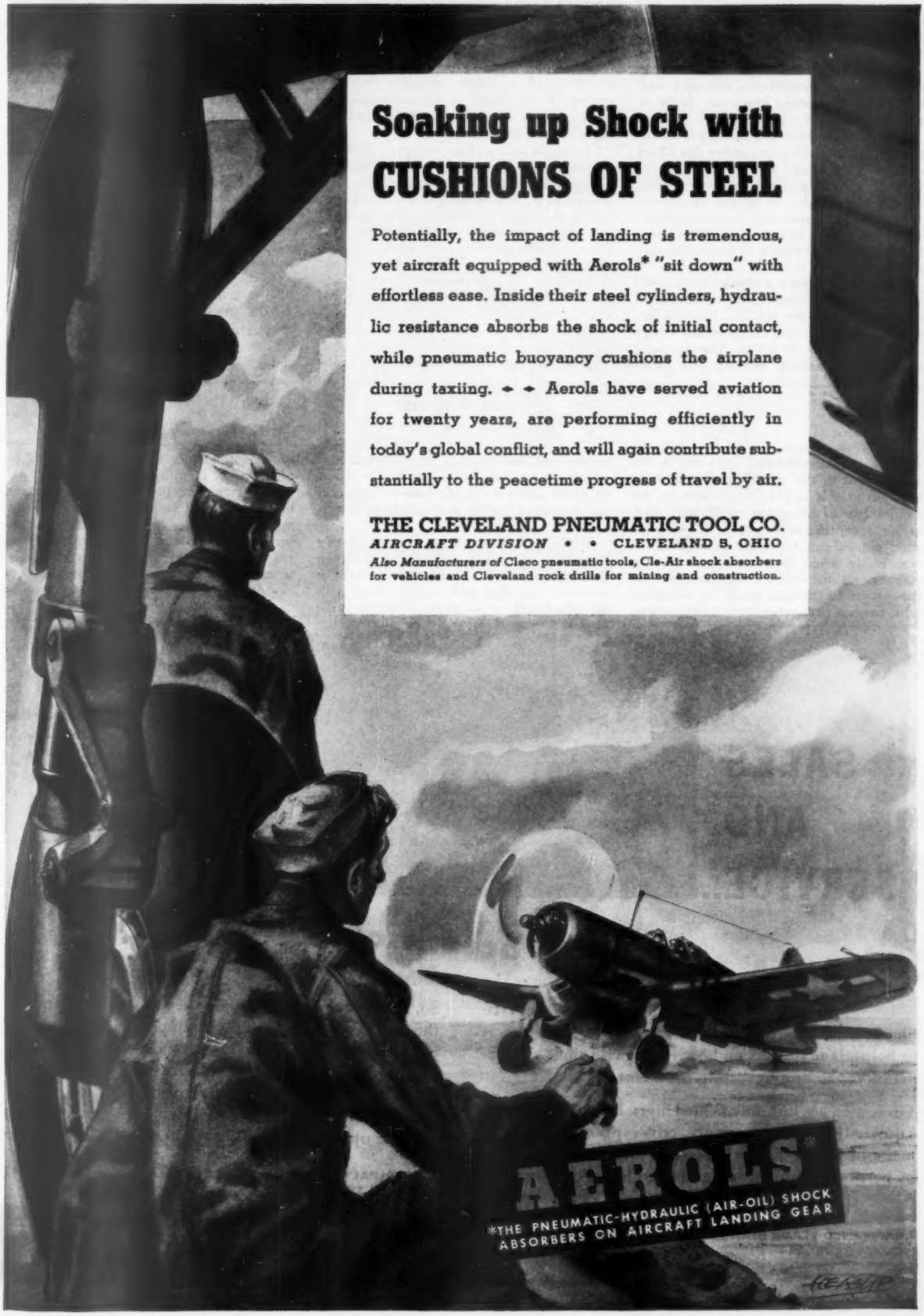
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AEROLS
*THE PNEUMATIC-HYDRAULIC (AIR-OIL) SHOCK ABSORBERS ON AIRCRAFT LANDING GEAR

(*Continued from page* 118)

will be available as the result of excellent training being received by American youths now.

6. The finest data will be available about weather conditions overseas and land areas that never knew the drone of motors prior to World War II.

NATS is not under the Bureau of Aeronautics but is a division under the Chief of Naval Operations and is in charge of Capt. D. F. Smith, USN, of Washington, D. C. He and his staff are concerned primarily with planning and co-ordinating activities of squadrons. Wing commanders have authority to move the cargoes speedily.

Many of America's victories at sea and in landing operations could not have been possible without the NATS. There is the case of a Navy vessel which ended a high speed forced run to South America with a broken crankshaft. Seventy-two hours after the Navy's Bureau of Ordnance was notified a new 2,000-pound crankshaft and a crew of technicians had reached the ship.

In another case an electrical fire aboard a submarine required extensive replacements of the main drive controls and power cables. A total of 18,000 pounds of parts was needed.

Thirty-six hours after receipt of the first information, all material was in the air headed for the repair base and was delivered at a point 10,000 miles from Washington in plenty of time to make repairs.

A new submarine enroute to the war zone suffered serious damage to an engine and asked for replacement parts for delivery to an intermediate base on its prescribed route. All parts were delivered before the sub reached the base.

There are others too numerous to mention. These, however, should give some idea of the importance of NATS in moving vital supplies to the war zones.

NATS pilots have proved themselves useful in a number of other capacities. On several occasions on scheduled flights they have spotted Axis submarines and have reported their location to the coastal patrol. They also have reported the locations of survivors of ship sinkings.

The Naval Air Ferry Command at present is delivering some 3,000 planes a month to the Navy. The three squadrons are based at New York, Columbus, O., and San Francisco. So far all deliveries have been within continental United States, but as the war progresses and large aircraft come off the assembly line in quantity for the Navy, ferry pilots are expected to move the craft overseas.

Thus, from a humble beginning, NATS and its important ferrying branch have grown to a vast organization geared to the tempo of a war greater than any in history. END

Local Airlines

(*Continued from page* 70)

Whether experimental lines are a desirable tool in the initial development of local airlines is largely dependent on the availability of adequate equipment such as the Beech 18's or *Voyagers* (C-45's). If such planes can be made available at a reasonable price, it would seem best to start operations under temporary two- to three-year certificates which would carry with them a first refusal on a subsequent permanent certificate of convenience and necessity, provided the operator is found to be fit and able as well as willing, and his system of routes susceptible of development.

While the type of service will vary from one line to another, it is assumed that passengers, mail and express will be carried, that flag and regular stops will be scheduled on an average of every 50 to 75 miles and that pick-ups will be made every 15 miles or so.

Flag stops are preferred to skip stops, because skip stops destroy a major segment of local line service, namely the interconnection of small communities. Flag stops, on the other hand, in combination with pick-up service, will permit the operator to pick up mail without landing

(*Continued on page* 126)

SALES AND SERVICE..

The Fastest Overhaul and Repair Service and the Largest Stock of Parts and Supplies Anywhere in The Middle West.

with the accent on SERVICE

SNYDER'S flying Service Engineers cover the entire Middle West. Their job is to help plane owners and operators with their maintenance, repair and operating problems.

These men are not only skilled fliers, but their technical knowledge and experience cover practically every make of plane, motor, accessory, and instrument used by personal plane owners and fixed-base operators.

So, if you are having trouble keeping your planes in the air or if you are contemplating changes or repairs of any sort, or if it's just a case of what supplies are best for your particular needs, it will pay you to contact SNYDER and have yourself placed on the itinerary of one of these able and obliging Service Engineers. You will not obligate yourself in any way.

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APPROVED REPAIR STATION NO. 294

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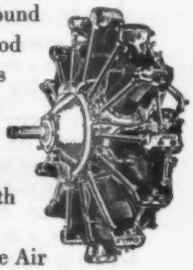
Poor man's power plant

THE Jacobs engine was designed and built primarily for the working pilot whose plane was his business, whose own resources were his service and maintenance departments. The engine was — and is — as simple, rugged, frill-free and accessible as any engine of its rating can be. It proved its values in the Depression years as a dependable power plant, capable of sustained, day in and day out operation with a minimum of care and low cost maintenance. In crop dusting, charter flights, passenger and mail transport, and in the Canadian bush, it won a reputation as the workhorse of the aviation field.

When the war broke, the Jacobs engine was ready, reliable, proven. Selected for the twin-engine trainers that carry the fledgling pilot through the transition from single-motor to multi-motor ships, Jacobs engines make more take-offs, spend more time at full throttle, than larger units in combat service. And despite student handling, the wear and tear of training, varied climate and field conditions, the Air Forces found that the 350-hour overhaul period first established as regulation was unnecessary; later advanced the period to 700 hours; and lately has authorized 25% more time, with an additional 25% optional with engineering officers.



Jacobs' fine record in serving the Air Forces training program and the taxpayers well and cheaply is an indication of the capacities of these engines that will stand aviation and industry in good stead in the postwar period when costs will count as well as performance! . . . Inquiries are invited. Jacobs Aircraft Engine Co.

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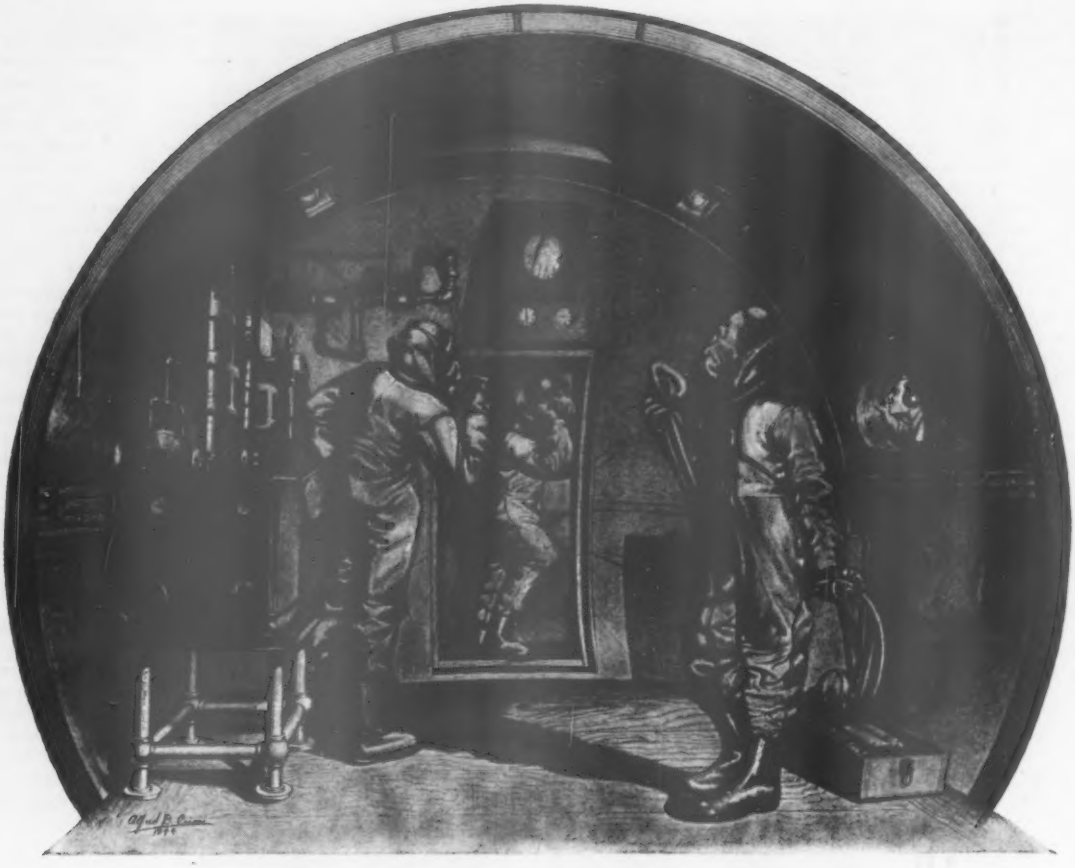

This will take a man higher even than a P-51.

THIS scientific apparatus looks quite earth-bound.

But, for experimental purposes at least, it can take a man higher than any aircraft ever built.

It is Sperry's new High Altitude Laboratory, constructed through the cooperation and assistance of our Government, and dedicated to the service of our Country in memory of Frederic Blin Vose, a Sperry engineer who lost his life in the performance of his duties in the war effort.

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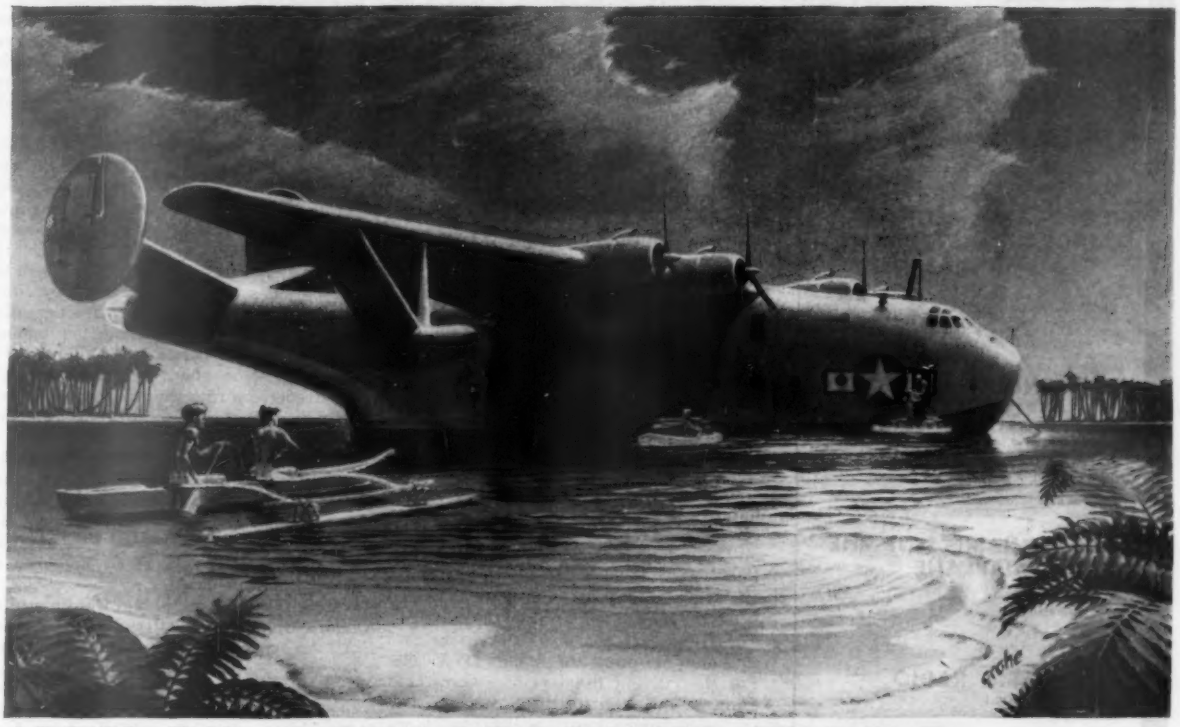

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Into the Mars went hard-won Martin knowledge gleaned from construction of the original trans-Pacific Clippers . . . the giant Russian Clipper . . . and the Navy's long-range patrol bombers. From the Mars have come further important findings which will lend added speed, safety and comfort to tomorrow's greater Martin airliners. The Martin Mars is doing more than help win a war . . . she's blazing the trail to a new and brighter tomorrow!

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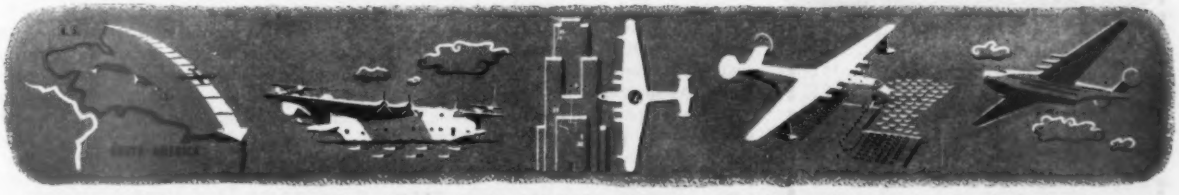

4375 Miles, Non-Stop from Maryland to Natal, Brazil, were flown by the Mars. She carried 16 persons, 13,000 lbs. of mail, broke many records. The Mars is powered by four 2200 h.p. engines.

From an Actual Photo of the Mars showing a standard sport plane on each wing, this gives some idea of her size. Mars' wings are so thick that crew can enter them to service engines while in flight.

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(*Continued from page* 122)

where no passengers are to be taken on or let off, as well as at the regular pick-up points. Once experience with individual routes has been gained, schedules can be set up in accordance with the number of stops indicated. Thus, with planes that can cruise at 150 to 180 m.p.h., there would appear little doubt that schedules calling for a route speed of approximately 120 m.p.h., compared with surface transportation speeds of 30 to 40 m.p.h., could be adhered to.

There is no question that local airlines would require Governmental aid at first, and there appears little question that in most cases this aid could be reduced to a point where, within a period of two to four years, little or no subsidy would be involved. This time element, of course, would depend on the rapidity with which manufacturers can develop and deliver aircraft that are tailor-made for the service, the ability of the management, and the potentialities of the individual route systems involved, not to mention three-cent airmail.

In regard to Government aid, an examination and analysis of Post Office cost ascertainment reports shows that since 1935, air mail has resulted in deficits to the Post Office Department of $6,000,000 in 1935, up to $9,000,000 in 1940, from which peak they declined to $3,000,000 in 1942. The trend was sharply reversed in 1943 to show a profit of some $17,500,000. For the current fiscal year, ending next June 30, the profit of the Post Office Department from air mail will probably exceed $30,000,000. Thus, the profit from air mail for the two years ending next June 30, after all "terminal and distribution" expense, applicable railway transportation costs and overhead, will approximately equal the losses of the previous seven years. It is also significant that the 1944 profit is sufficient to pay 25 cents a mile for two round trips per day on 80,000 miles of routes.

Prospective rates of local airlines must, of course, depend substantially on estimates of operating expenses. Thus far, estimates submitted to the Civil Aeronautics Board indicate that operators and manufacturers contemplate a plane with a combined passenger, mail, and express pay load of upwards of 3,000 pounds, including partly convertible passenger accommodations for six to 12 passengers. With the ground services being planned, it is estimated that total corporate expenses plus a reasonable return on the investment will be in the area of 35 to 40 cents per airplane mile. The accuracy of these estimates, of course, is obviously dependent on many variables: the technical development of engines and planes, plane utilization, ground services, wage scales, obtainable route speeds, lengths of stops and distances between stops.

For a 12-passenger plane, these costs would amount to between three and three and one-third cents per seat mile, which closely approximates that of existing airlines operating with DC-3's. Even with a load factor as high as 50 to 60 per cent, a line would require mail income unless it charged six to seven cents per passenger mile. With bus and rail (coach and Pullman) fares ranging from one and one-quarter to four cents per mile, and trunk airlines at five cents, it appears obvious that a six to seven cent fare would be uneconomical.

Mail and passenger revenue are doubtless the chief potential sources of income for airlines in the immediate future and the reduction of rates can be achieved only by developing the volume of both simultaneously.

In this connection, it should be pointed out that mail payments to the airlines are currently averaging less than 0.34 mills per pound mile, from which the airlines are deriving, as a whole, about 25 cents per plane mile. The low average rate is due to the fact that over 95 per cent of the pound miles are generated by lines receiving the 0.3 mills rate. Incidentally, the railroads are paid a rate equivalent to 0.14 mills per pound mile. Thus, for a service that is about one-third as fast, they receive a rate that is about one-half as high as that paid for over 95 per cent of the airmail.

Individual airlines receive from 0.3 mills to just over five mills per pound mile, with All American receiving around eight mills. The high rates are, of course, due to the lines being on a plane-mile basis with relatively small amounts of mail actually carried.

Seven lines, namely, Mid-Continent, Inland, Colonial, Continental, Northeast, All American and National, carried from 60 (All American) to 250 (National) pounds per plane mile, or an average of about 145 pounds during fiscal 1943. Thus, from this rather thin basis, and assuming the re-establishment of six cent airmail postage, we can get an indication of what local lines can aim at, namely: from about 70 pounds of mail per mile where surface competition is heavy and routes are marginal to over 200 pounds.

These seven lines, operating some 7,500 miles of routes, are receiving annually about $2,800,000, which is equivalent to 2.6 mills per pound mile and 38 cents per plane mile, as compared with 25 cents for all airlines. It would not, therefore, seem out of line for the government to put up 25 cents, more or less, per plane mile for two years or so to get a local airline started. This is between 60 and 70 per cent of the estimated total operating cost of 35 to 40 cents per plane mile and is substantially less than seven existing lines are getting. It would permit a four to four and one-half cent per mile passenger fare on a 10- to 12-passenger plane with a load factor of 30 to 40 per cent. Compared with the 1941 experience of the six passenger lines mentioned this is no more than could be expected by local lines for a year or so.

The third source of revenue is air express. To date the seven small airlines mentioned above have been able to do little to develop this source of revenue. Their poundage has been low, averaging little more than 30 pounds per mile which, in combination with a rate of around one-quarter of a mill per pound-mile, has produced little more than one cent per plane mile.

There is, therefore, no basis for estimating more than, say, one cent per mile

(*Continued on page* 130)

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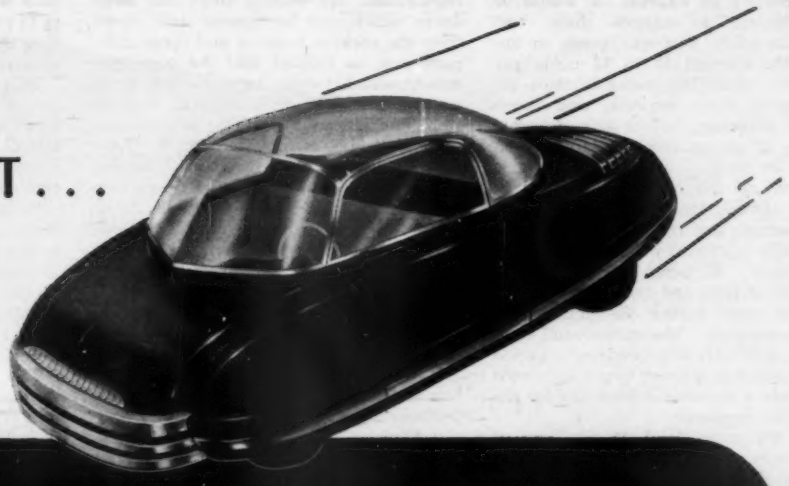
I PREDICT . . .



by George W. Walker

Industrial Designer of Detroit

"The car you will own, in what engineers call the *post* post-war period, will take greater advantage of streamlining for beauty and efficiency. Running boards will disappear, permitting wider bodies and more seating room. There will be foam rubber upholstery, soundproofing, opaque colored plastic panels and plexiglass windshields and tops that will provide greater visibility and safety. The small car sketched here is designed with the engine in the rear and enclosed running gear, permitting an extremely short turning radius. The car your War Bonds will buy will be fully air-conditioned, making window ventilation unnecessary and eliminating the present-day annoyance of draughts, rain and dust."

Note: The Weatherhead Company, one of the oldest and most important manufacturers of parts for the automotive industry, is prepared for the day when its four plants will again be contributing to the country's peacetime automotive needs.

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(*Continued from page* 126)

for prospective air express. It would be over-optimistic to expect these two sources in early post-war years to approach the current 10 to 12 cents per plane mile which the major airlines are now getting from express, and much study is necessary before any accurate estimates of prospective air express volume can be made.

To sum up the question of rates, it looks as though local airlines providing both passenger and mail service could be successfully launched with a mail-rate of approximately 25 cents per plane mile and a rate of four and one-half cents per passenger mile during the initial two years of operation. Thereafter, mail rates could be gradually reduced over a period of a few years to a point where they constitute only a reasonable payment for the fast service rendered.

To go into more detail on the types of planes required to fly the routes, it would seem that desirable specifications include (1) twin engines and low power loading so as to provide good single engine performances and other related advantages; (2) the payload to provide for six to 12 passengers with a portion of these accommodations readily convertible to cargo space by means of folding seats and moveable partitions; (3) pilot and co-pilot, the latter acting as passenger attendant, ticket seller, pick-up mechanism operator and handler of cargo and express; (4) cruising speed of 150 to 180 m.p.h.; (5) high maneuverability, especially at low speeds and altitudes; (6) landing speeds of 50 to 60 m.p.h.; (7) tricycle retractable landing gear capable of withstanding relatively severe cross wind landings and quick taxiing turns and stops; (8) minimum take-off and landing space requirements so as to enable the use of Class II airports (2500- to 3500-foot runways) in accordance with present regulations; (9) folding steps and large doors which can be opened and closed from the cockpit, luggage and cargo compartments so located that the passenger can handle his own luggage—and cargo can be unloaded from outside without steps and special carts; (10) self starters with batteries strong enough to make them independent of ground batteries, and cockpit control of rudder and elevator locking device; (11) range of 250 to 400 miles with full pay and fuel loads under present regulations; (12) initial prices of $25,000 to $40,000 and minimum operating costs. The size of the plane would vary to accommodate payloads from 1,500 to 3,000 pounds, with the latter predominant.

If local airlines are to be established on any substantial mileage of routes, the experience and practice of the Motor Carrier Division of the Interstate Commerce Commission, which has some 100 branch offices throughout the country, demonstrates the need of the Civil Aeronautics Board to decentralize itself along similar lines. Its procedures must be as simple as possible and it must be set up to handle expeditiously not only the new route applications now on hand but particularly the innumerable small changes in schedules, routes and stops that will become necessary as traffic develops.

With the equipment and rate systems described here, local airline service could apparently be developed on a route mileage basis and possibly on a plane mileage basis so as to surpass the pre-war domestic trunk line system. Were premium postage dispensed with and all first class non-local mail and parcel post transported by air whenever its delivery could be expedited, it would not be many years before local airlines could carry the mail at a rate that included little or no Government aid. At the same time mail revenue would be produced in such amounts as to permit more frequent schedules and thus the development of a greater volume of passenger and express business.

This statement is based on one of the four requirements that are fundamental in all short and medium distant transportation; namely, that up to a point the more frequent the schedules the more traffic is generated per schedule. It is all very well to propose two round trips a day to start with, but not until a local airline can operate dependable schedules as frequently as every hour for upwards of 16 hours per day, and even 30- to 15-minute schedule frequency during the peak hours, will it become a really prosperous system.

The other three requirements of local transportation are accessibility, speed, and economy.

Suffice it to say at this point that the operation of anything approaching 100,000 miles of local airline routes within a year or so following the war would provide many thousands of jobs, not to mention the jobs indirectly created in the manufacturing and construction industries producing the equipment, and building and operating the airports needed.

The economic, operational and regulatory difficulties facing the development of local airlines have to do largely with equipment, method, and timing and differ little from the problems which have confronted the Civil Aeronautics Board and the present airlines throughout their peacetime development.

The benefits to the entire economy of the country, and to the public in jobs, convenience and time, can be of tremendous post-war importance and are well worth every promotional effort on the part of the Government and of private operators and capital. END

Pacific Report

(*Continued from page* 53)

ping and air bases, Smith got some remarkable combat pictures. During the attack on Truk, Smith's pilot, Lieut. Paul E. Dickson, dived on a Jap tanker, launched a torpedo and zoomed away. During the zoom, Smith twisted around and shot a picture of the torpedo's wake as it headed for the tanker. Just as the picture was taken, the torpedo hit and the ship blew up and sank. The torpedo squadron in which Smith's plane was flying got 17 hits out of 36 torpedoes launched. One got a direct hit on a Jap destroyer, which sank in 90 seconds.

Smith says the official "box score" claimed by the Navy is far too conservative. While the Navy claimed a total of 19 Jap vessels sunk and "seven probables," Smith saw "between 40 and 60" ships in the harbor during the first day's operations at Truk. On the second day there were only two ships in Truk and both were afire. Smith says the unofficial score

(*Continued on page* 134)

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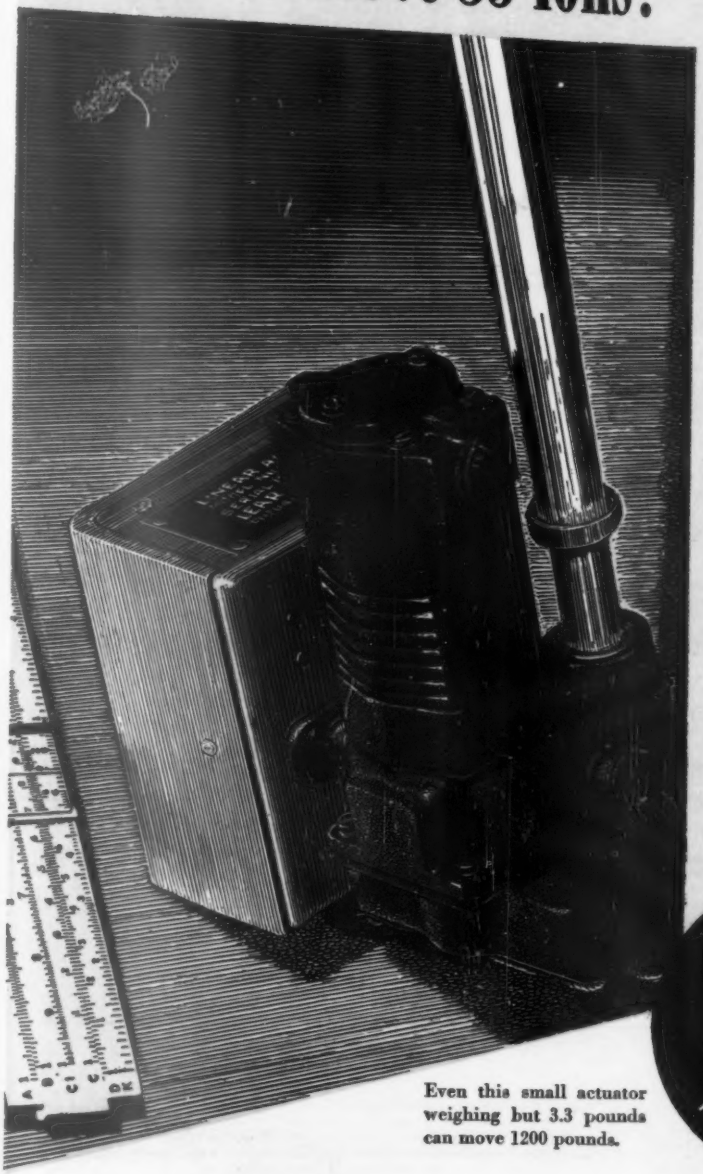

Even this small actuator weighing but 3.3 pounds can move 1200 pounds.

WE wouldn't tell you how fast America's fighting planes go. That's a military secret.

But we've all read it's well over 300 miles an hour.

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Did you ever stop to think that the plane's flaps and controls have to work surely, smoothly and dependably against pressures like that?

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But the day is coming when they will have different jobs to do. New jobs on peacetime products—perhaps like steering ocean liners, or parking cars, or things we've never thought of.

That is one reason for this advertisement. We want to know who can use an actuator or a motor like these.

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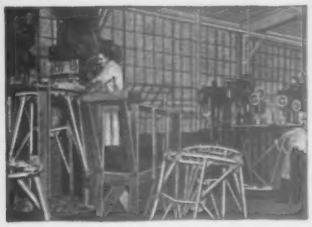
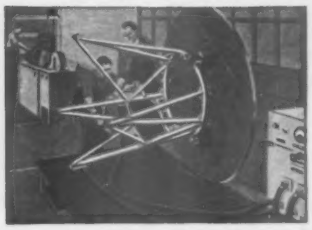


Product of Evans Engineering—a specially designed machine drills, spot-faces and taps, simultaneously, six of the eighteen engine mount lugs.

Evans Welding Division—here, certified welders turn out, to Evans high standards, the tubular structures for the toughest engine mount made.



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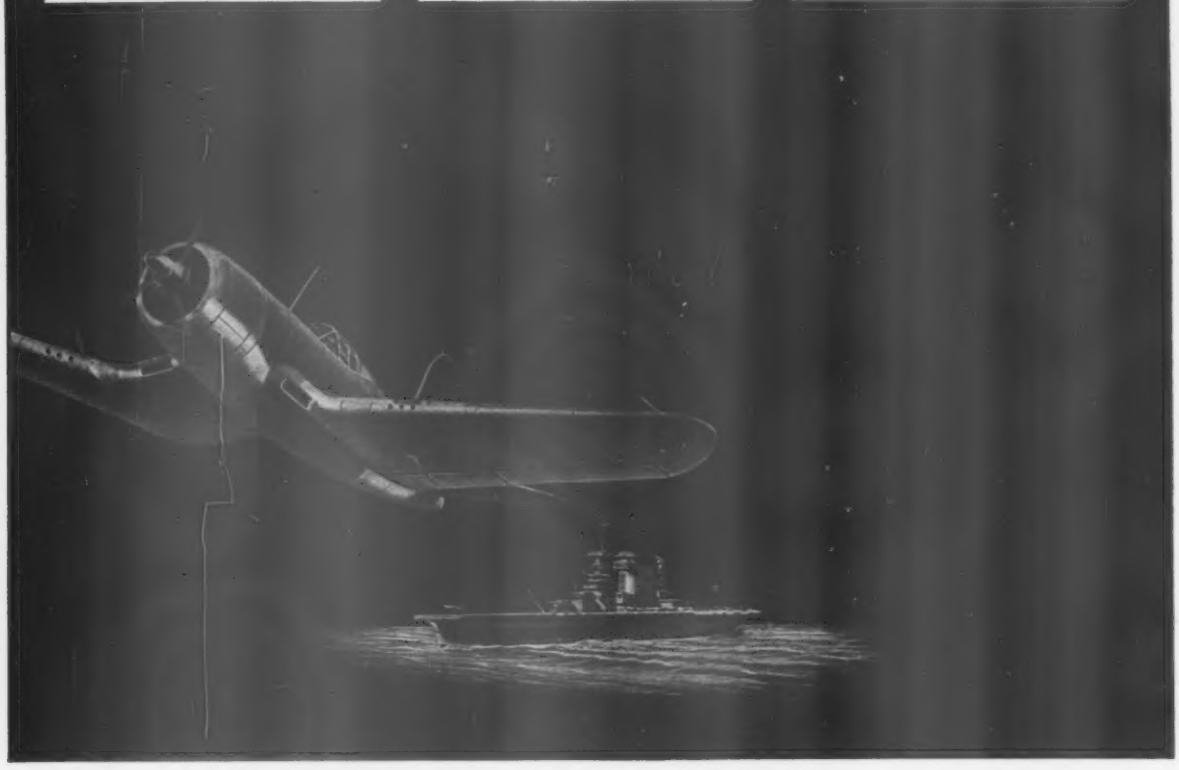

cradle for the Corsair's power

Cradle for the powerful engine in this deadly fighter must be amazingly strong and rigid. Building this engine mount is one of the many Evans wartime assignments which this organization, through years of manufacturing and engineering experience, is covering with dispatch and honor.

Evans developed new types of welding fixtures which increased welding efficiency 30 to 40%; Evans also designed special machinery which reduces machining time by 75%; and an Evans conducted school teaches the new welding procedure to carefully selected craftsmen.

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Other Sky Products by Evans are used extensively by the Air Forces. These are employed on missions of such importance that they can not be described at this time.

Evans engineers will welcome an opportunity to discuss your air cargo problems with you.

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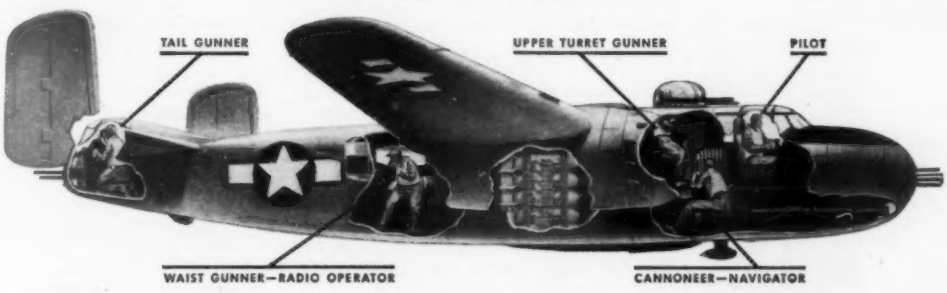

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(*Continued from page* 130)

was between 50 and 54 Jap ships sunk—including one escort carrier, which 12 *Helldiver* pilots from Smith's carrier agree they all hit.

In several of the strikes in which Smith flew, the Japs were caught on the ground and all but wiped out. In the attack on Tinian, for instance, the Navy task force knew the Japs knew they (the Americans) were headed for the enemy base, because Jap planes continually tried to attack the force at night as it approached its objective. Yet, 12 hours after the first Jap plane was known to have spotted the task force, the American planes roared down on the Tinian air field to find Bettys, Sallys, transports and miscellaneous aircraft standing wing tip to wing tip in the best pre-Pearl Harbor fashion. The carriers' pilots got an estimated 80 planes on the ground that day.

On February 22, the task force celebrated Washington's Birthday by striking Guam. There again, a large number of Jap planes were smashed on the ground—among them two old American Douglas DC-2's.

Jap planes, Smith says, are respected but not feared by U.S. Naval pilots. The American aircraft are far superior to those of the Japs and have proved themselves able to beat the Jap against heavy odds. The famed Zero fighter, Zeke, still is widely used. According to Smith, it still can outmaneuver anything in the Pacific. But it is extremely vulnerable and, when hit, is almost always a flamer.

The newer Jap fighter, Tony, has proved a little harder to shoot down. Pilots on Smith's carrier say it looks like a "stepped-down Messerschmitt." It is powered with a German inline engine and is more heavily armored than the Zeke. But the *Hellcat's* and *Corsair's* six .50 caliber machine guns are still its master.

Standard Jap twin-engined torpedo bomber is the Betty, technically the Mitsubishi OB-01. Large numbers of the planes knocked out on the ground by the Navy task force were Bettys. Standard Jap single-engined torpedo plane is Kate, a fairly close copy of the obsolete American Vought *Vindicator* (SB2U). The only dive bombers Smith saw were single-engined Vals (Aichi K-99) which came out from Rabaul to attack the task force.

Smith saw one of those Vals shot down in spectacular fashion—and got a photograph of the *Hellcat* pilot and his plane a few seconds before the incident took place. One of the few *Hellcats* from Smith's carrier that was not escorting bombers into Rabaul was that flown by Ens. Bill Watts. As the Jap dive bombers dove to the attack, all the carrier's anti-aircraft guns threw solid sheets of fire in an effort to break up the attack.

In the midst of this Ensign Watts gunned the engine of his *Hellcat*, roared down the carrier's deck—while his own antiaircraft guns fired over his plane at the diving Vals—and zoomed off the deck into the air. His wheels and flaps still were down when he saw one Val breaking through the American barrage. He kicked rudder, got the Jap in his sights and blew him out of the sky. Then he retracted his wheels and flaps. It was Watts first combat mission and his first kill, all within seconds.

Another unusual kill involved a *Hellcat* pilot from another carrier in the task force. This pilot got on the tail of a Kate as the Jap plane started its torpedo run on one of the American carriers. But when he pressed his trigger, the *Hellcat's* guns refused to fire. Doing some split-second thinking, the pilot pulled his fighter up above the Kate and released his belly tank full of 100 octane gasoline right on top of the Jap plane. The tank burst as it hit and the Jap blew up in flames. Although many carrier pilots later scoffed at the story, it subsequently was verified by eyewitnesses and the pilot got credit for his unusual kill.

Navy pilots unanimously agree, Smith found, that the shoulder safety belt is the greatest single safety development yet devised in this war. So many lives have been saved by these belts, so many serious injuries avoided, that no pilot would fly without them today.

The three U.S. Navy combat types with which Smith came in close contact were the *Hellcat, Avenger* and *Helldiver*. The *Hellcat* currently is the only carrier-based fighter used in combat in the Pacific. The Vought *Corsair* now is entirely land-based, although it was reported, just before Smith left to return to the States, that the *Corsair* soon would be reassigned to carriers. Following is a summary of what carrier pilots told Smith they think of some of the aircraft types they are flying:

GRUMMAN HELLCAT. As with all Grumman aircraft, Navy pilots especially favor the *Hellcat* (F6F). Whether or not the *Hellcat* can outfly the *Corsair* or vice versa is frequently debated, with strong arguments on both sides. It is generally conceded that the *Hellcat* is easier to operate on and off a carrier; "Butch" O'Hare called it "an old man's airplane." Only complaint against the *Hellcat* Smith reports having heard is that its range is too short. Otherwise, all fighter pilots agree, it is as near-perfect as a pilot could want it. They also say its cockpit is the best laid-out of any airplane in the Navy.

CURTISS HELLDIVER. Now working out quite well, after a long series of pitfalls. Pilots now flying them in the Fleet are sold on them because, they say, the *Helldiver* is a long step in the right direction and has many potentialities. It has excellent deck-landing characteristics, particularly because of the wing slots which give remarkable control at low speeds. It is easiest to fly in a dive-bombing pull-out. But it still has its troubles: the hydraulic systems almost always leaked badly, it is hard to fly long distances, tiring the pilot quickly. It is extremely difficult to change the plane's course during a dive. Because of a Navy-specified window in the bomb door, the bomb bay has given carrier crews trouble. The bomb displacement gear frequently jams in the down position.

GRUMMAN AVENGER. The "grandma" of the Fleet. One of the most dependable planes, it can carry almost limitless loads;

(*Continued on page* 138)

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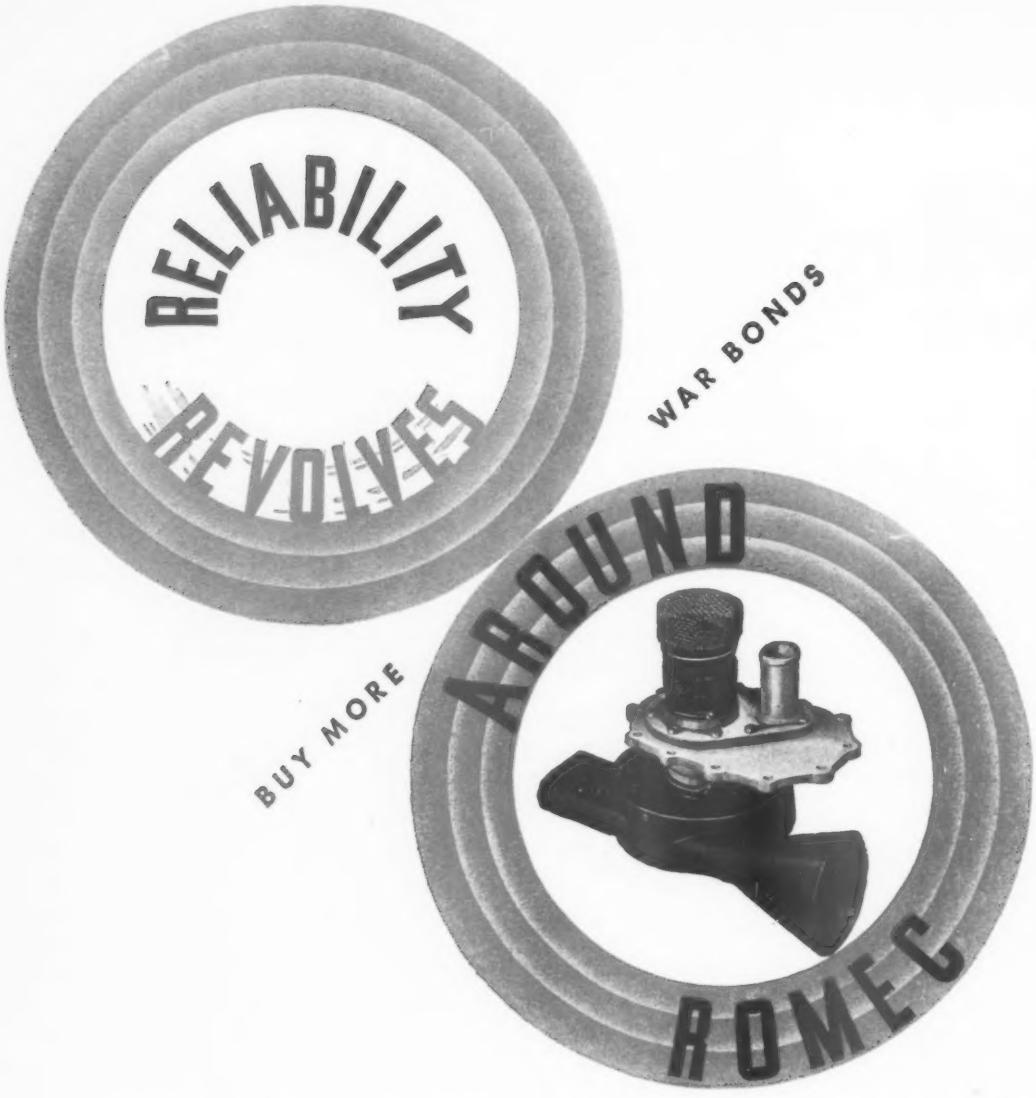

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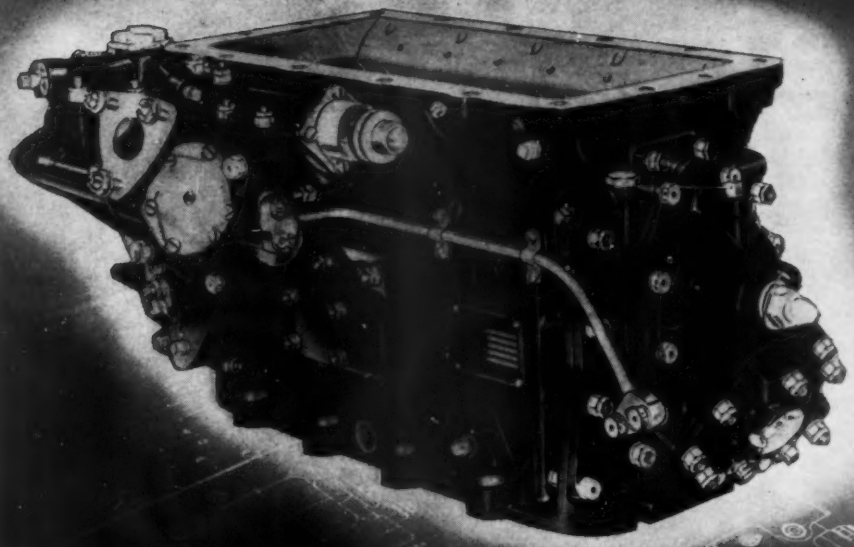

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(*Continued from page* 134)

pilots say "if there's room she'll carry it, no matter what it weighs." Its maneuverability is poor and the *Avenger* now is the slowest plane aboard carriers. It is good at skip-bombing (Smith's pilot skip-bombed a Jap building with incendiaries for the first time with an *Avenger*). This versatile plane also does excellent glide bombing and has even been pushed over into near-dive bombing. In the category for which it was designed—torpedo bombing—it probably is the world's best. Also a good level bomber, the *Avenger* was for a while equipped with a bombsight. It has good range and firepower.

Smith is back in the United States for editorial conferences and to get his six cameras repaired. All of them were wrecked or damaged during his six months in the Pacific. END

CQTU

(*Continued from page* 56)

sighted and the flight breaks formation, going into single file. As the planes enter the carrier's landing circle they are just a few feet off the water. Each student pilot approaches the carrier's stern in the manner he was taught during the simulated landings at the airfield.

The instructor, meanwhile, returns to Glenview to lead out the next flight. In good weather the flight is left to return by itself after all its pilots have qualified. In bad weather, however, the CQTU instructor usually lands aboard the carrier, puts his plane on the outrigger and waits until his flight has qualified. He then takes off and leads the flight back to Glenview.

As the CQTU trainee heads his plane for the arresting gear on the stern of the 550-foot-long *Wolverine* or 585-foot-long *Sable*, nearly everything he sees and every signal he receives is identical to what he will see aboard his carrier at sea. Both are equipped with the Navy's standard arresting gear; both have the latest radio devices. But, unlike combat carriers, the *Wolverine* and *Sable* do not have below decks facilities for aircraft; all planes landing aboard must fly back to Glenview or be tied down on the deck until weather conditions permit resumption of flying. In case of an accident, the plane either is repaired on the deck or on a starboard outrigger and then flown off, or the carrier must stop operations and return to its anchorage, where a barge-mounted derrick lifts the damaged plane off the flight deck.

Although nearly all CQTU operations consist of training, the unit's safety record is amazing. In the more than 40,000 landings and take-offs on both carriers there have been 11 fatalities—and only two of those took place on a carrier itself. Of the 10 others five were due to inadvertent spins, two were caused by a mid-air collision and two were lost in a snow storm. All other CQTU accidents have been confined to comparatively minor crashes into the barriers or catwalks, with an occasional plane dropping into the lake due to the breaking of an arresting gear cable, or a student pilot losing control of his plane during a take-off. Pilot injuries have been infrequent and minor in these instances, due largely to the shoulder safety belts installed in all Navy planes.

Temporarily-assigned officers and the enlisted crews of each carrier live aboard. Most of the carriers' permanent officers live ashore. Some of the carriers' crews (about 275 officers and men per ship) are veterans of one or more Naval battles, assigned because of their knowledge and experience, to the *Wolverine* or *Sable* to help train new officers and men for carrier duty with the Fleet.

Although the CQTU carriers are primarily for qualifying Naval airmen, they also are important in training carrier deck crews, from hook-spotters to landing signal officers. Most of the enlisted deck crewmen are assigned to the *Wolverine* and *Sable* from Chicago's Navy Pier, one of the world's largest ground schools for Naval aviation technicians.

Landing signal officer trainees—called LSO's in the Navy—come from the Fleet. All are veterans of the war, mainly from the Pacific. To date, all but six have been Naval aviators, veteran airmen with a steady, quick eye and the ability to make accurate decisions instantaneously. Because of their tremendous responsibility—during plane landings the whole carrier operates around the landing signal officer—LSO's are hand-picked, with great care. The LSO almost literally flies each airplane onto the arresting gear by a series of arm signals; the plane's pilot never takes his eyes off the LSO when making a landing, and he must obey implicitly every signal given him by the LSO.

Because of the character of these duties, the fact that six non-flying LSO's have been trained successfully by CQTU to date has established a precedent in Naval aviation. According to Lieutenant Commander Preston, it is impossible to distinguish between the flying and non-flying LSO's when they are at work. The only thing the six non-flying LSO's had in common was the fact that all were especially active in sports before joining the Navy. Their peacetime jobs were: advertising salesman, wool buyer, paper salesman, ground school instructor, college student and insurance salesman.

Had it not been for the imagination and far-sightedness of Capt. Richard F. Whitehead, now in the South Pacific, the present Carrier Qualifying Training Unit might never have existed. While aviation aide to the Commandant of the Ninth Naval District, he conceived the idea of improvising an aircraft carrier from an excursion steamer and suggested that such a training carrier serve as the hub of all carrier-qualification training.

CQTU first came into existence on August 1, 1942, and, for a while, consisted of two units. One operated from the Naval Air Station at Norfolk, Va., using the

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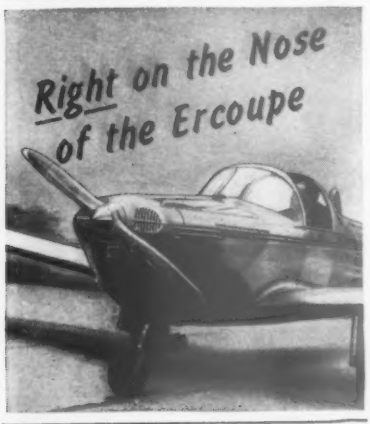

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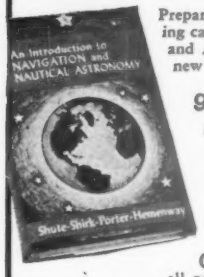

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U.S.S. Charger, a merchant vessel that had been converted to an escort carrier. The Glenview unit was second, using the *Wolverine*. When the conversion of the *Sable* was completed, the Norfolk unit was transferred to Glenview, the two units becoming the present single unit.

Only deterrent has been Lake Michigan's usually heavy winter ice, which could smash up the converted carriers' flimsy wooden paddle-wheels in a few revolutions. Because of the ice, the carriers usually tie up and lie idle for three months during the winter. This year Chicago's winter was so mild that both carriers operated throughout the year.

At present, Capt. Charles L. Lee commands the *Wolverine*, Comdr. Kenneth Craig the *Sable*. These officers decide whether CQTU operates that day or not. If Captain Lee or Commander Craig decide conditions are not suitable, they inform CQTU by radio. Commander Preston and his officers then assign their students to "bounce drill" on a practice airfield. END

ASC, North Africa

(Continued from page 50)

ally, each combat group was serviced by a service squadron, part of the service group around which the service center was built. The service squadron was located on or close to the airdrome of the combat group it assisted and, with its special equipment, machine shop, instrument, technical supply and other trailers, its field shops and its specialists, the squadron took over where the combat group ground crews left off.

The ground crews of the combat units maintained their own airplanes and vehicles, changed engines on the former and loaded planes with gas, oil, bombs and ammunition. The service squadron repaired the planes and vehicles. Its sheet metal workers repaired flak damage, instrument men repaired damaged or worn out instruments of most types, airplane mechanics replaced buckled landing gears, chewed-up tail groups, flak-broken controls. What shops were not contained in trailers were set up under tentage or in any shacks which could be built or structures which could be requisitioned. The propeller shop needed a draught-proof tent and a pit for the delicate job of balancing a propeller assembly. The parachute shop needed a high tent or tower for hanging and drying chutes. Most popular of all shops in hot weather was the instrument trailer; an air-conditioned bit of heaven in the hot North African desert.

The service squadron commander kept in close contact with the commanding officer of the combat group; the service squadron engineering officer worked with the combat group engineering officer. Such close co-operative relations resulted in leveling any wall between the mechanics and others of the combat unit and members of the service unit. When the group had had a run of tough missions resulting in a large number of planes in the service squadron's hands undergoing repair, the squadron was quite likely to be snowed under for a week or so.

Before the service squadron commander hollered for help from his service unit superior he was more likely to have received an offer from the combat group engineering officer to loan him some skilled mechanics. One combat group in turn found it was necessary to change a large number of engines at one time. The service squadron commander furnished a number of his own men to help out and also dug more men and equipment from his superior, the service group commander. But all this was the normal way of handling abnormal situations.

A service squadron commander, asked for whom he worked, was more likely to name the commander of the combat groups his outfit serviced than his own service group commander who was his superior in the chain of command and who recommended him for promotion.

Not all service squadron men worked in the immediate area of the squadron. Some went out on the "flats" to haul in wrecks. Others were out with their shop-on-wheels repairing craft which had forced-landed.

Officers fresh from the States sometimes questioned the efficiency of so much decentralization, pointing out, for example, that depot shops should be better equipped and organized than field units to adjust and repair instruments. Those in charge, however, feared that too many mechanical eggs might be found in one depot basket and bombed by the enemy. For the same reason that the combat unit dispersed its planes about the airdrome, the Air Service Command dispersed its engineering effort and supply facilities. There was also the problem of airplanes which had to be repaired on the spot. Hence, the service squadron mechanics were and still are field mechanics and not shop men.

By the time this is published many of these service squadron officers and men will have known all the problems of work in the Mediterranean weather, from the raw cold rainy days of winter with a mud coating over everything, to the blistering days of summer when the sirocco blows furnace-like from the Sahara and dust is everywhere. When they return to their homes they will talk gustily of "C" rations on the first Christmas Eve in the rain and mud at Cazes, of more mud at Tafaroui, the desert station at Biskra, the big explosion at Navarin, the tragic sirocco at Chateaudun, the odors of Lac Tunis, the heat at Souk el Arba, the endless days of dust near Pont du Fahs, the wonderful swimming on the beaches at Menzel Temime after an honest day's work and so on until they run out of breath. "It was a great war," they'll tell you. But the *flying* lads, from the combat crews to General "Tooey" Spaatz himself, will bear witness that one of the great accomplishments of the *air* war was the untiring, unselfish and efficient service of the Northwest African Air Service Command. END

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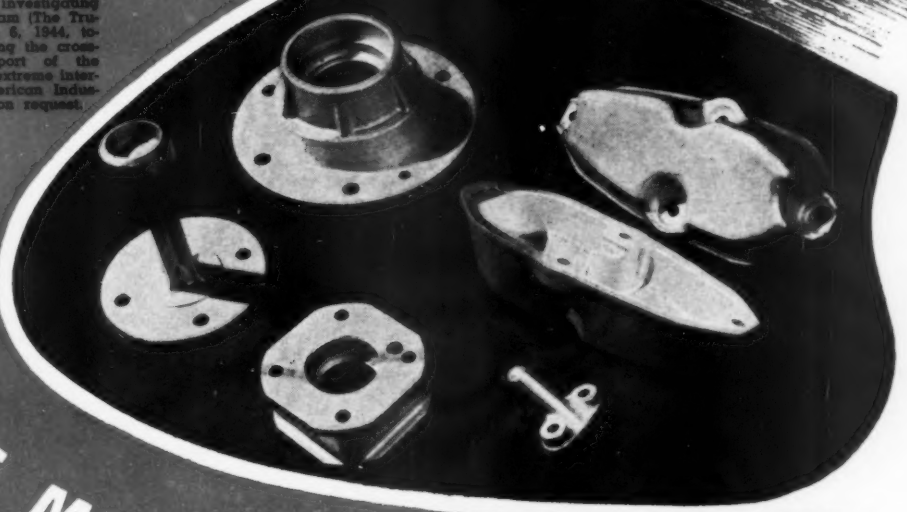

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Air Transport and the Future

(*Continued from page 23*)

ing trend is mail. When the airlines in the United States were carrying four and five billion pound-miles of air mail annually, the additional 150 billion pound-miles of non-local first-class mail in the United States looked like a formidable load. But from 1936, when they carried 9,772,000,000 pound-miles of air mail, until 1941, when they carried 22,559,000,000 pound-miles they took a 144 per cent increase in stride. In the following fiscal year they increased their load to 31,729,000,000 pound-miles, and in the 12 months ended June 30, 1943, they carried exactly 56,731,000,000 pound-miles, up 79 per cent. This latter increase was accomplished with only about 50 per cent of their former equipment. For the fiscal year ended June 30, 1942, the latest period for which the data are available, there were only 148,261,000,000 pound-miles of additional non-local first-class mail carried in the United States. With a little more time, the greater portion of first-class mail may be carried in the air at rates twice those of ordinary mail.

But the volume of mail transported by surface means should not be taken as a final criterion of what the volume might be if the carriage of all mail were accelerated to the speed of air transport.

To say that potential mail for the air is limited to what is now carried by surface means would be similar to having said in 1860 that the potential mail for the first transcontinental railroad in the United States, which was not to be completed until nine years later, was the amount of mail which was carried on the famed Pony Express from Saint Joseph, Missouri, to the Pacific Coast. On the first trip, on April 3, 1860, 25 letters were carried. At first, service operated every Tuesday. Later it was increased to twice weekly. The average number of letters per trip gradually grew to 90. By contrast, the number of pounds of air mail alone moving only from New York City to California in a week in June, 1940, averaged over 1,100 pounds per day, or over 33,000 letters.

Speed is of the utmost value in communications. People in Washington will spend $1.20 to send a 10-word telegram across the continent to Los Angeles. Before the war, people in the United States were sending and receiving an average of around 35,000 messages a day to and from foreign countries all over the world.

The greatest advantage of airplane speed for mail is realized in transportation over long distances. In the United States, over 20 per cent of air mail in a week in June, 1940, was carried 2,300 miles and over. More than 21 per cent, however, was carried less than 600 miles and during the past 10 years air mail has increasingly absorbed relatively short-haul traffic. This is evidenced by the decrease in the average haul of air mail from 1,715 miles in 1931 to 1,382 in 1942.

Opportunities are also great and ultimately unpredictable in air cargo. The airplane can place into the channels of trade the resources of the hitherto inaccessible regions of the earth almost overnight. The airplane might reach out to an increasingly large number of markets, whose size might not alone warrant the capital cost of ground transportation facilities, but which would warrant tapping by air cargo. The airplane might create large new hinterlands for national and world trade.

The most controversial issues concerning the future of air cargo arise from debates over the amount of freight traffic which airplanes will absorb from other carriers and will be able to create in regions where surface transportation facilities are already highly developed. Here, too, what seems to many the impossible might take place. Speed may become a commercial habit and necessity. What one shipper dares to do in shipping by air, others may, by his success, be compelled to follow. The flexibility and speed of the airplane are factors whose full force and possible effect have not yet been measured in peacetime commercial practice. They will certainly result in a reorientation of our economic life.

Any discussion of the future of air cargo ultimately comes to the vital question of rates. This was also one of the early difficulties of the railroads. We hear today the same sort of thing about rates and the freight-carrying possibilities of the airlines as the railroads did a hundred years ago. In 1895, Edward A. Moseley, secretary of the Interstate Commerce Commission, pointed out, "As late as 1850 there seems to have been little conception of the influence which the railways were to wield in the development of the interstate traffic of this great country, and of the country itself. It was thought that they could not successfully compete with waterways and canals except where a speedy carriage was essential."

But air cargo rates are coming down rapidly and drastically.

As the movement of passengers and mail in large amounts over long distances is a modern phenomenon, so also is the movement of freight in great quantities. In the United States, the average ton-miles of freight transported per capita increased from 644 in 1880 to a yearly average of 993 in the period 1882-1890. From that point they grew, with downward fluctuations in depression years, to a yearly average of 2,402 ton-miles per capita in the decade 1931-1940.

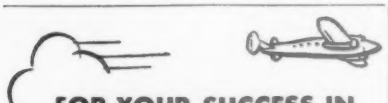
During this same period, the average haul of freight increased from 112 to 191 miles. Thus there was an increase in freight tonnage per capita and it was hauled longer distances.

The average haul of freight will be extended by air transportation, particularly in countries having a large area and in international commerce. The average haul of United States domestic air express in 1941 was 547 miles. While it had dropped from 589 in 1936 and from a recent peak of 622 in 1938, the future trend will be to a longer average haul. The recent drop undoubtedly reflects the attraction of frequency of service on short-haul traffic in a relatively small total volume.

The speed of air and surface freight facilities stands in sharper contrast than does air and surface passenger services. While the average speed of the freight train has increased from 11.5 m.p.h. in 1921 to 16.5 m.p.h. in 1941, it still takes about three days for less-than-carload shipments of freight to go from New York to Chicago and about eight to nine days from New York to San Francisco. With rail express, the times are 18 hours and 84 hours, respectively. These compare with air cargo times of five or six hours and approximately 20 hours, respectively.

This greater speed of air transportation

(*Continued on page 148*)



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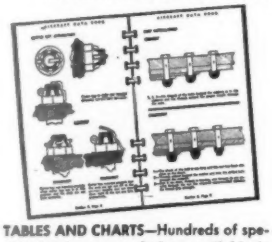

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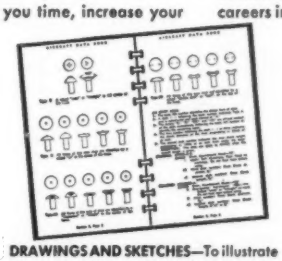

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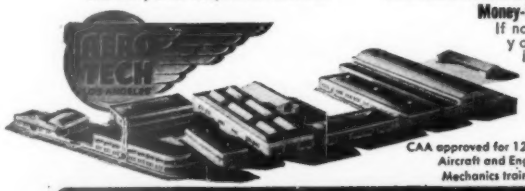

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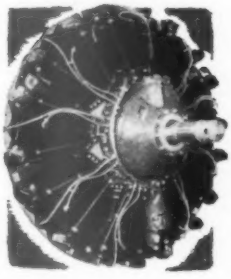

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(*Continued from page* 144)

has already demonstrated part of its value. The number of pound-miles of air express carried in the United States increased 194 per cent in five years before the war, from 2,822,000,000 pound-miles in 1936 to 8,300,000,000 in 1941. The rate paid was from five to six times higher than the highest rates of any other form of transportation in the United States.

Speed also draws a premium rate in surface transportation. Many railway express rates average in the neighborhood of 15 cents per ton-mile, and a considerable amount of rail and truck less-than-carload freight moves at rates above six cents per ton-mile. It has been estimated that the average gross revenue or charge to the public for rail express is 11 cents per ton-mile for all classes of less-than-carload traffic; rail express full carload charges have been estimated at three and one-half cents per ton-mile. These rates, because they promised speed, have drawn volume traffic from lower-cost forms of transportation. If air cargo rates were the equivalent, there would be little reason for the cargo to move other than by air; when they are only a little above, the greater speed will serve as a magnet to draw much of it to the air. In both cases, the increased speed will create new traffic.

Water transport provides, of course, the cheapest means of freight movement in the world. But the contrast between air and steamer shipping times is sharper than between air and the fastest modern land transportation. Some of the greatest developments in air cargo will be in the international field. Products which could not be shipped across the ocean because of their perishability will enter international trade.

Speed in transportation has both concrete and intangible values. Harold A. Osgood points out: "Inventories need only be sufficient for a few weeks, where months were formerly necessary; goods are in transit a few days instead of a matter of weeks; a tremendous amount of capital formerly locked up in these items is now released. Investment of capital in storage facilities may be diminished; the cumulative processes of converting raw materials into finished goods are steadily being speeded up. Carrying less stock, stores become decreasingly vulnerable to changes in styles and to whims of public fancy; with less money tied up in their inventories, manufacturers are more ready to modify their products to suit changing demands."

A decrease in packing and handling costs will also be a characteristic of air cargo shipments. Damage will be less. Insurance and interest charges will be reduced. Overhead will be less and turnover more rapid. Flexibility will obviate much trans-shipping. The airplane can take cargo to or carry it from the factory landing strip. While there will still be perishable shipments, there will be no perishability in shipments traveling with the speed of air transportation. These are only a few of the many advantages of air cargo.

As international passenger traffic develops, air rates should drop to about seven and one-half cents per passenger-mile; it is more than likely that they will continue to decrease at a lesser rate to five cents and proceed more slowly to within a close range of four cents.

All domestic and virtually all international first-class mail will be carried by air. Air rates will be established for second-class mail. An air parcel post will be created. The volume of mail will increase by reason of the new social and business relations between people hundreds and thousands of miles apart, but separated only by a few hours.

Air cargo will hasten development of now industrially inactive and remote areas. It is reasonable to expect that domestic rates will be cut in half to 35 or 40 cents per ton-mile; that they will decrease comparatively gradually to around 15 cents a ton-mile; and that they will continue to press slowly downward. It is also probable that the revenue from air cargo will exceed that received from passengers. Transoceanic cargo rates will naturally tend to be slightly higher than domestic rates and the growth of traffic volume will be slower.

The tide of history and the present momentum of our life are moving toward these ends.

They bring a world radically different from anything in history, small, closely-knit. Economic, political, and social relations must be reoriented in men's minds. When this great stimulus to life is felt fully, I have confidence that man will rise to meet his new opportunity in accordance with his destiny. END

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Report from Washington

(*Continued from page 65*)

flag pole on the roof. I eased one wing up to the flag pole and spun around and around the pole till we got down to the roof—a perfect landing."

Candidates for the LOG may apply with similar data to this column. No affidavits are required.

The long-heralded international conferences on aviation may be scheduled definitely following the return of State Department's Adolf A. Berle from a visit to England, but then again it may not. . . England wants all the dominions in on the meeting, while our people are said to be holding out for representation limited to us, England, Russia and China. . .

—FRED HAMLIN

The AIR WAVES

(*Continued from page 57*)

both for the rank the woman will have and, in some cases, for the assignment she will receive.

All such commitments, however, will be based on the age and civilian experience of the applicant. At the time the new regulations were issued, the Navy said:

"Under the new regulations, a definite commitment of rank, according to age, will be made through the Office of Naval Officer Procurement where the applicant enters the Navy.

"A promise of assignment to duty in a special field, such as the supply corps, hospital corps, aerology, air navigation or radio electronics may be made, with the understanding that the immediate needs of the Navy may necessitate a change in these plans. Fulfillment of these commitments is contingent upon the women's successful completion of training."

The age limits established for original commissions in the Waves are:

Ensigns, 20 to 23; lieutenant junior grade, 34 through 41; lieutenants, 42 through 49.

The Navy also has made provisions, however, to give a spot promotion to a woman limited by age provided she qualifies for a billet requiring a higher rank.

Since comparatively few women have the training or ability required in the various branches of aviation, the Navy has issued a special appeal to women having an aeronautical background to apply for commissions in the WAVES.

In the field of radio electronics the applicant must not only meet all basic requirements but she must not be over 30 unless she has been working in some related field requiring technical knowledge of this character.

The educational requirements are a degree from an accredited college, including one year of physics and one year of college trigonometry or calculus. Also desirable are courses in electrical engineering and electronics.

In the same field are needed women with administrative ability who have had at least three years of business experience, including one year of executive work.

Applicants for posts in the field of aerology should be 20 to 35 and should have a college degree which included at least one year of calculus and one year of physics.

Also desirable in this branch is training or study in climatology, oceanography, heat gases, weather elements, aircrafts, effect of temperature variations, air masses, weather maps and charts, equations and formulas and charts and graphs.

WAVE officers who pass such requirements may expect, after further training, assignments to such billets as: supervision of aerological departments, supervisor of personnel in such departments, analysis and preparation of weather charts for all forecasting purposes including all types of aircraft operations, single ship operations, and extending to forecasts for task forces composed of many ships; and preparation of weather summaries for various areas of the globe.

Women with special training or study in biology and physiology also are needed in connection with the Navy's vast aerial program. In addition to a college degree and courses in biology and physiology, desirable requirements include teaching experience and an ability to handle people.

Such applicants should have a personality that will enable them to teach a class composed entirely of men. The billets include:

Handling a low-pressure chamber and conducting research in connection with conditions of high altitude flight; lecturing to male aviation cadets on the use of oxygen in high altitudes; conducting tests in low-pressure chambers to observe and record physiological reactions to atmospheric pressure at different altitudes.

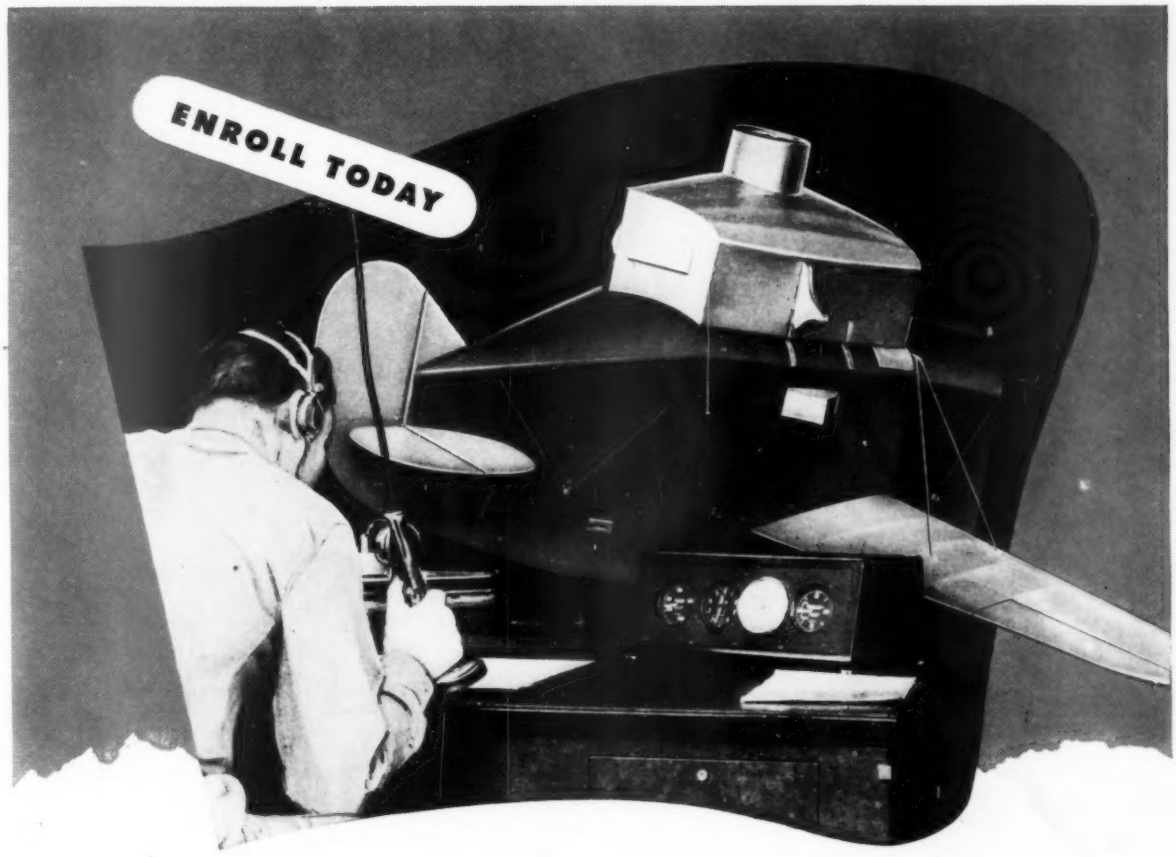
Also needed greatly are applicants who can qualify for instruction in aerial navigation. In this branch age requirements are 20 to 35 and education must include a college degree with courses in mathematics through trigonometry.

Desirable background for this service is civil aviation, particularly as instructors in ground schools. Also helpful is background that includes a pilot's license and teaching of science or mathematics.

Billets in this branch include teaching and posts as technical or administrative assistants at Naval flight preparatory, preflight and primary training centers.

According to information from Naval training centers, such WAVE officers are not resented by male cadets in training provided they know their field thoroughly and are able to hold the interest of classes.

END



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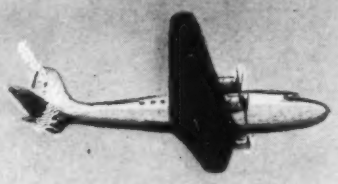

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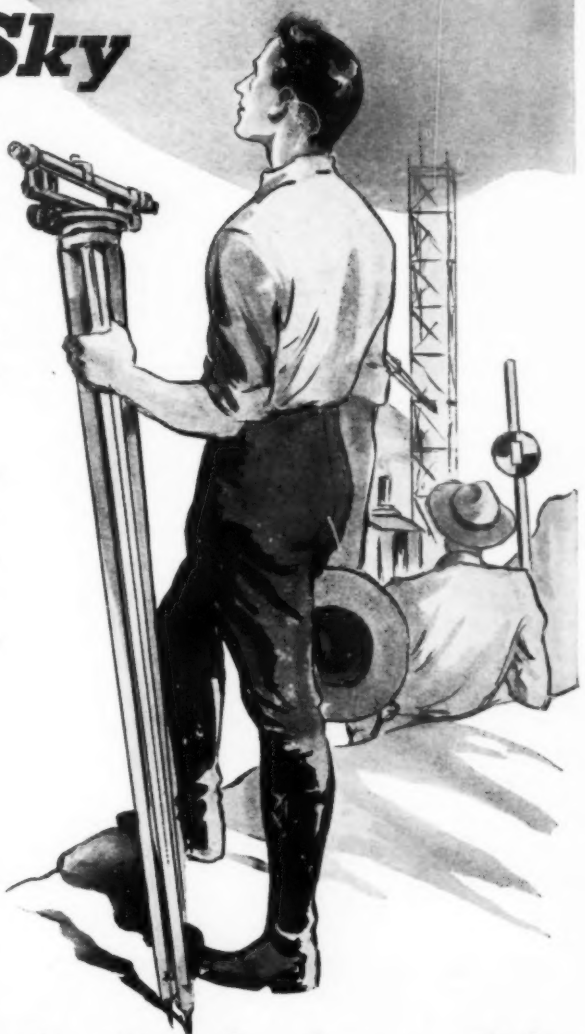

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New Giant

(*Continued from page 27*)

The new DC-7 is by far the largest of this group. Its wing span is 173 ft. 3 in., as compared to the *Skymaster's* span of 117 ft. 6 in. Length of the DC-7 is 123 ft. 4 in., height, 43 ft. 8 in. The new giant is designed to carry 86 passengers as a day plane, and 76 passengers as a sleeper plane—40 passengers in berths and 36 sitting up. The crew will be between seven and 11.

Proposed weights of the DC-7 are:

Take-off weight, 145,000 lbs.; landing weight, 126,100 lbs.; empty weight, 85,890 lbs.; useful load, 59,110 lbs.

Power, as now contemplated, will be provided by four radial air-cooled engines estimated at 3,000 h.p. each. Collectively, that would give the DC-7 a total of 12,000 h.p.—more than the power of two four-unit diesel railroad engines, each of which develops 5,400 h.p. With such power plants the proposed airliner will have a top speed of approximately 400 m.p.h. and a range of about 4,000 miles. The whole fuselage is expected to be supercharged for high altitude flying (estimated service ceiling of the DC-7 is 40,000 feet). Air pressure inside the fuselage will be maintained at about 8,000 feet, no matter at what altitude the airplane actually is flying.

All Civil Aeronautics Administration requirements for an Approved Type Certificate will be met, according to Douglas engineers. These engineers also state that, if the CAA will approve a stalling speed of 85 m.p.h. for the DC-7, the landing weight of 126,100 pounds will be permissible. According to a Douglas report: "This assumption is considered reasonable because of the development of new blind landing devices, the size of the airplane, and the type of service for which it was designed."

Comfort and convenience for passengers are high points of the design. There will be chair and compartment sections, lounge, bar, buffet and dining areas; upper, middle and lower berths; coatroom, four toilets, crew and stewardess quarters and cargo space under the flooring.

A distinguishing feature of the external appearance of the DC-7 will be the "bug eyes" in the nose, two streamlined orbs, one containing the pilot, the other the co-pilot. They can be seen in the artist's sketch accompanying this article. These replace the usual pilot inclosure to effect more efficient streamlining.

Cost of a single DC-7 will be about $1,250,000, depending upon a reasonable production quantity, according to Douglas officials. That cost will vary somewhat, depending on what versions actually go into production, new aircraft developments and other developments.

The Douglas study of the DC-7 says:

"The costs of operation for the DC-7 are based on the best available data, and assume that the airplane operates at an average payload factor of 65 per cent, or carrying on the average 65 per cent of its maximum payload. Overhead expenses are assumed to average about 85 per cent of the direct operating costs, which have been found in the past to give reasonable economy figures.

"In order to present a fair comparison, the operating costs for both the DC-4 and DC-7 are shown for sleeper versions with de-icing and cabin supercharging.

"At a range of 2,400 miles, the DC-3 does not get into the running because of limited fuel capacity and (if fuel were available) very low payload. The DC-4 . . . will cost 4.7 cents per 200-pound mile, and the comparable DC-7 will cost 3.8 cents per 200-pound mile, or 19 per cent less than the DC-4."

Douglas officials estimate it will require about 90 men per plane to keep the DC-7's in service, thus requiring the airlines to hire approximately 9,000 persons to fly, maintain and service the planes if the estimated 100 planes are built. END

15 YEARS AGO

FROM the June, 1929, issue of this magazine:

In a full dress attack on U. S. air policy, Brig. Gen. William Mitchell, ardent advocate of a separate air force, complained that "we still tie our air power to an Army and a Navy instead of organizing it into a separate department, untrammeled by training, jealousy and pork barrel politics." He charged that former President Coolidge, in appointing a study commission on aeronautics, had "stuffed the deck," appointing persons "well known to be hostile to the independent development of aviation." He also contended that the value of planes operating from aircraft carriers in time of war "will be nil, because these ships can be sunk at once with the greatest ease by aircraft acting from land bases. It is absolutely impossible to defend them either by gunfire or by aircraft." . . .

A need for college-trained aviation engineers in the airplane manufacturing industry was reported. . . . Lieut. Bernard Hoy, USN, contended that comparatively few accidents were caused by engine or aircraft failures, but most by pilot failures. . . .

The firm of Black & Bigelow, Inc., commissioned by the magazine to analyze costs of establishing air service on a typical route (New York to Cleveland), with five-passenger planes, concluded that traffic costs per passenger mile would vary from 14.9 cents with one plane in daily operation to 9.2 cents with eight planes.

A new aircraft invention provided for installing dozens of air-filled balloons in the interior of plane wings and fuselages to make the craft water-buoyant. . . . Four patents for rotating-wing and helicopter-type aircraft had been issued recently. . . . END

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The Fleet Air Arm

(*Continued from page 31*)

branch and RNVR differentiates the Royal Navy Volunteer Reserve from the regular navy.

British students in the U. S. found to be suitable pilot but unsuitable officer material are returned to England to complete pilot training.

Young Britishers from all walks of life are enrolled in the great adventure of Naval aviation training in the United States. They are lectured on American customs and habits in much the same way that U. S. service-men are instructed on life in England.

Comic strips and "cokes" are at the top of the list for the British boys. It doesn't take them long to switch from mild amusement at the amount of space devoted to cartoon strips in U. S. newspapers to becoming ardent followers of Joe Palooka and Superman.

They quickly take up the soda fountain idea, with "cokes" way out in front in popularity. One devotee became such an ardent "coke" addict that his appearances in the dining room became less and less frequent. The doctor questioning him finally discovered that he had a daily diet of 20 "cokes" with extras thrown in whenever there was time.

Students are selected for specialized training according to fleet requirements and their own suitability. This training is supervised by the U. S. Navy at Fort Lauderdale (torpedo), Vero Beach (dive bomber), and Miami (fighter).

On completing these courses students are sent to the Naval air station at Lewiston for final individual instruction. Here the Royal Naval Squadron is staffed with British instructors who teach pilots the difference in flight procedure between the two navies.

The last phase of instruction is three months of unit training, called "working-up." Fighter and dive-bomber squadrons work-up at Brunswick, torpedo pilots at Squantum.

Now the pilots are ready for combat. They leave directly from the United States, many of them in complete units with the British crews flying American planes from U. S.-built carriers (CVE's) manned by British crews.

The insignia of the Fleet Air Arm pilot is a pair of outspread gold wings. A wreath in the center surrounds a fouled anchor, the entire insignia surmounted by a red and gold crown. British pilots wear their wings on the left sleeve just above the top row of gold braid when dressed in blue uniform. In summer khakis and whites the wings are worn on the left breast as in the United States Navy.

Except for the rank of sub-lieutenant in place of ensign, and the elimination of the intermediate promotion of lieutenant, junior grade, the rank of British naval aviators is identical with that of U. S. Naval pilots.

There are some other differences in duties and organization. For example, in the FAA, a naval observer is carried as part of the airplane crew. He is a specialist in air navigation, bomb aiming, radio operation and gunnery. The observer is responsible for the correct navigation of the plane and for the compilation, coding and transmission of radio messages, such as enemy reports, while on combat missions. In the U. S. Navy the pilot is responsible for these duties. The British, however, believe that modern air warfare calls for such an amount of complicated equipment and indoctrination that it is too much for one man to manage. The observers are usually officers trained at special schools in air navigation, bomb aiming, flexible gunnery, spotting, coding messages and operating radio sets used in combat.

The observers wear a special winged insignia with the wings having an upward sweep instead of the outspread position of the pilot's wings. The crown and anchor design are similar.

Great Britain is now expanding its naval air service personnel, ships and aircraft. The co-operative training just described has done much to develop the expansion program, and the allocation of U. S. converted carriers and modern American-built naval aircraft has helped Britain make up for the diversion of effort necessary to provide fighter protection to the British Isles and bomb Germany. END

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Coastal Cops

(*Continued from page 51*)

Navy aircraft called in for the kill by CAP.

One of the most important results of the anti-submarine patrol (and seldom mentioned) was the regular reporting of the weather. Each flyer reported the weather 100 miles off shore and all of the services used this information to advantage.

The pilots usually flew at 350 feet over the water. It was found that at this height they could see best under water. The planes were comparatively slow and were therefore able to spot mines sown by enemy subs. The faster, higher flying Army and Navy planes could not see these dangerous obstacles to shipping. The CAP has credit for 17 mines discovered and exploded. Some of these were in the paths of troopships.

CAP observers located 363 survivors of ships that had been torpedoed off the Atlantic Coast and of aircraft crashes at sea. They located 36 bodies. They also reported numerous aircraft and ships in distress, bringing about the rescue of crews.

In coastal patrol work alone, 26 CAP members lost their lives, seven members suffered serious injuries in the line of duty and some 90 planes were lost or damaged beyond repair.

The rigors of these patrols cannot be underestimated. The men flying their own ships had few of the comforts considered necessary for combat pilots. Of the 26 fatalities in the CAP anti-submarine patrol 20 were due to forced landings in the water, where the men froze or were drowned.

These statistics reflect countless instances of individual heroism, typical of which is the story of a rescue at sea for which Commander Sharp and his co-pilot, CAP Lt. Edmond I. Edwards, were awarded the Air Medal by President Roosevelt in a White House ceremony, in February, 1943. The airmen, flying a Sikorsky amphibian, spotted a man floating in the water. The man was Lt. Harry T. Cross, whose little landplane had crashed at sea and had already sunk, taking the observer with it to his death. Sharp and Edwards brought their amphibian down on a rough sea. Lieutenant Cross, badly injured and burned, was hauled aboard.

The left wing float of the amphibian had been damaged in landing on the 10-foot swells, and the Sikorsky was in danger of capsizing. To balance the plane, Edwards crawled out on the right wing where he clung for nearly 11 hours as the plane first was taxied toward the shore, 20 miles away, then was towed by a Coast Guard boat.

The activities of the coastal patrol were under Army orders and reports were subject to such strict military censorship that the country knew little of the exploits of the CAP volunteers.

That story is no longer a secret, and the record of our first aerial home-guard is one of brilliance, courage and sacrifice. END

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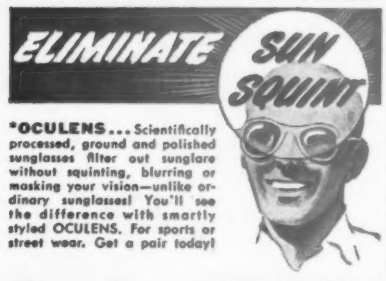
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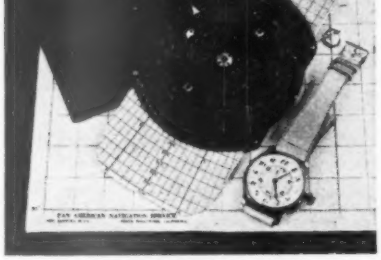

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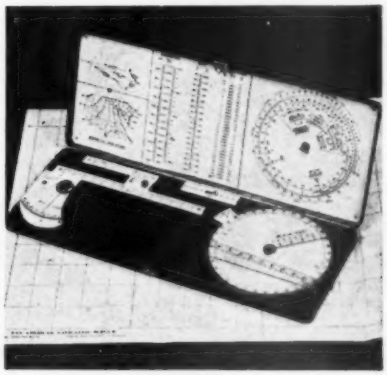

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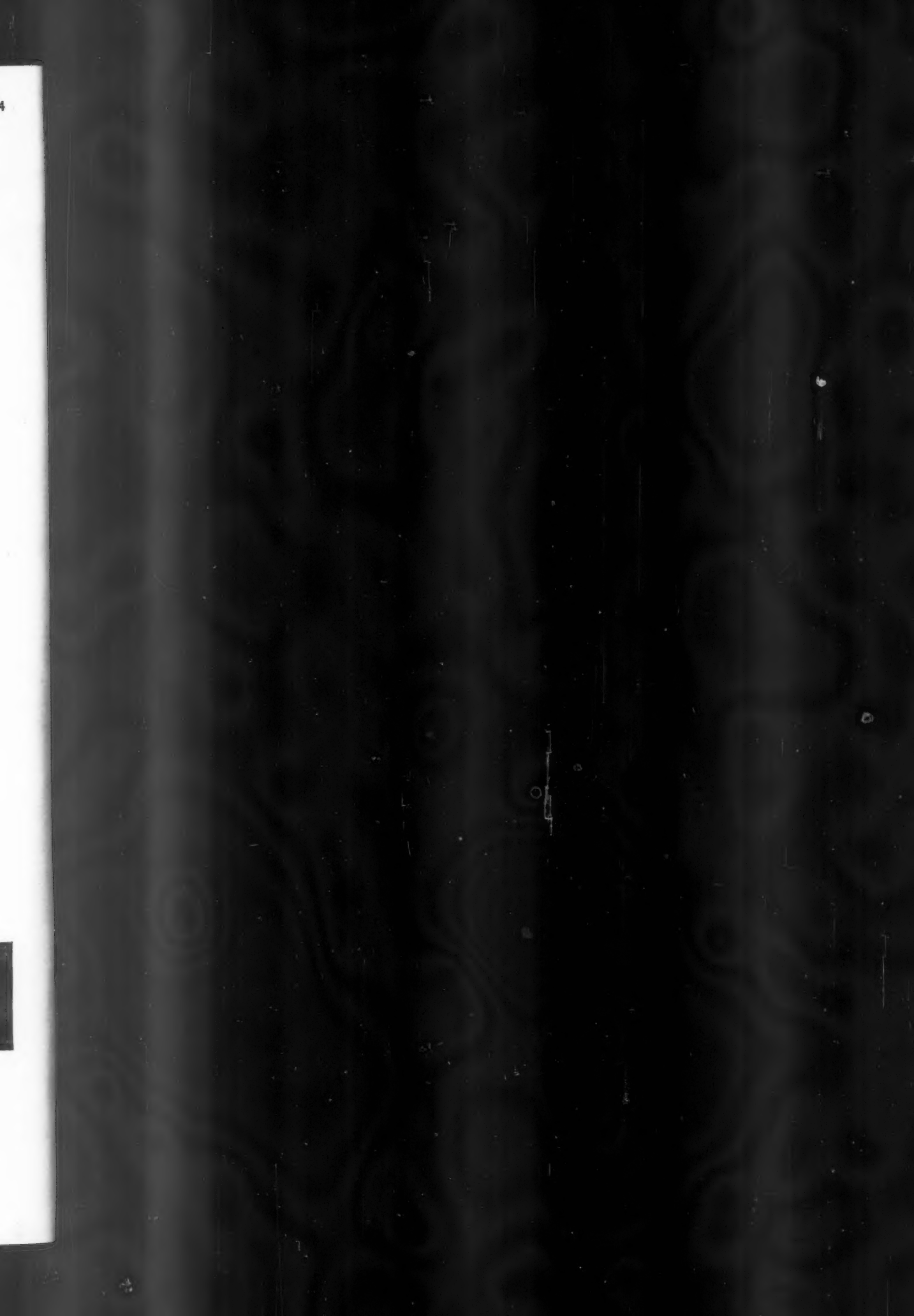
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